

RAILWAY MECHANICAL ENGINEER

With which is incorporated the RAILWAY ELECTRICAL ENGINEER

(Names Registered, U. S. Patent Office)

Founded in 1832 as the American Rail-Road Journal

August, 1948

Volume 122

No. 8

Roy V. Wright

Editor, New York

C. B. Peck

Managing Editor, New York

A. G. Oehler

Electrical Editor, New York

E. L. Woodward

Western Editor, Chicago

H. C. Wilcox

Associate Editor, New York

C. L. Combes

Associate Editor, New York

G. J. Weihs

Associate Editor, Chicago

C. W. Merriken, Jr.

Business Manager, New York

Published monthly by

Simmons-Boardman
Publishing Corporation

404 Wesley Ave., Mount Morris, Ill. Editorial and executive offices; 30 Church street, New York 7, and 105 West Adams street, Chicago 3. Branch offices: Terminal Tower, Cleveland 13; 1081 National Press bldg., Washington 4, D. C.; 1038 Henry bldg., Seattle 1, Wash.; 300 Montgomery street, Room 805-806, San Francisco 4, Calif.; 530 W. Sixth street, Los Angeles 14, Calif.; 2909 Maple avenue, Dallas 4, Tex.

SAMUEL O. DUNN, Chairman and President, Chicago; JAMES G. LYNN, Executive Vice-President, New York; ROY V. WRIGHT, Vice-Pres. and Sec., New York; C. MILES BURPEE, Vice-Pres., New York; F. C. KOCH, Vice-Pres., New York; ROBERT E. THAYER, Vice-Pres., New York; H. E. McCANDLESS, Vice-Pres., New York; S. WAYNE HICKEY, Vice-Pres., Chicago; H. H. MELVILLE, Vice-Pres. and District Sales Manager, Cleveland; C. W. MERRIKEN, Vice-Pres., New York; J. T. DEMOTT, Treasurer, New York; RALPH E. WESTERMAN, Asst. Treas., Chicago; ARTHUR J. MCGINNIS, Asst. Treas., New York.

The Railway Mechanical Engineer is a member of the Associated Business Papers (A. B. P.) and the Audit Bureau of Circulations (A. B. C.) and is indexed by the Industrial Arts Index and also by the Engineering Index Service. PRINTED IN U. S. A.

Subscriptions, payable in advance and postage free, United States, U. S. possessions and Canada: 1 year, \$3; 2 years, \$5. Other countries in Western Hemisphere: 1 year, \$5; 2 years, \$8. All other countries: 1 year, \$7; 2 years, \$12. Single copies, 50 cents. Address H. E. McCandless, circulation manager, 30 Church street, New York 7.

Roy V. Wright Dies..... 57

Mechanical Division Annual Meeting at Chicago..... 59

The General Committee Report.....	60
The Work of the Mechanical Division, by J. M. Nicholson.....	62
Research Is Finding Some of the Answers, by J. H. Aydelott.....	63
Some Current Safety Problems, by the Hon. W. J. Patterson.....	65
Railroads' Responsibility for Education, by Dr. H. T. Heald.....	66
Report on Locomotive Construction.....	66
Research To Improve Crank-Pin Design.....	70
Research To Improve Car-Axle Design.....	72
Locomotive and Car Lubrication.....	75
Development of Journal Bearings.....	76
Brake Equipment Developments and Changes.....	77
Report on Geared Hand Brakes.....	79
Report of Committee on Wheels.....	80
Committee on Car Construction.....	82
Modifications of Tank-Car Specifications.....	85
Loading Rules Revisions.....	86
Report on Couplers and Draft Gears.....	87
Report on Specifications for Materials.....	89
Safety Appliances.....	90
Interchange Rule Revisions.....	91
Report on Prices for Labor and Material.....	95
Investigations of Hot-Box Alarm Devices.....	96
Joint Report on Railway Sanitation.....	98

Editorials:

Roy V. Wright.....	99
What Electrical Men Are Doing.....	99
An Opportunity You Cannot Afford to Miss.....	100
Lubrications Practices Are Too Widely Different.....	101
What Electrical Design Has Done For The Diesel.....	101

Electrical Section:

The Locomotive Traction Generator Comes of Age.....	102
Power and Light for Terminals.....	107
Car Washer Improves Terminal Service.....	111

New Devices:

Complete Automatic Air-Conditioning Controls.....	112
Diesel-Electric Locomotive Operation Recorder.....	114
Improved Snubber Spring.....	114

News 115

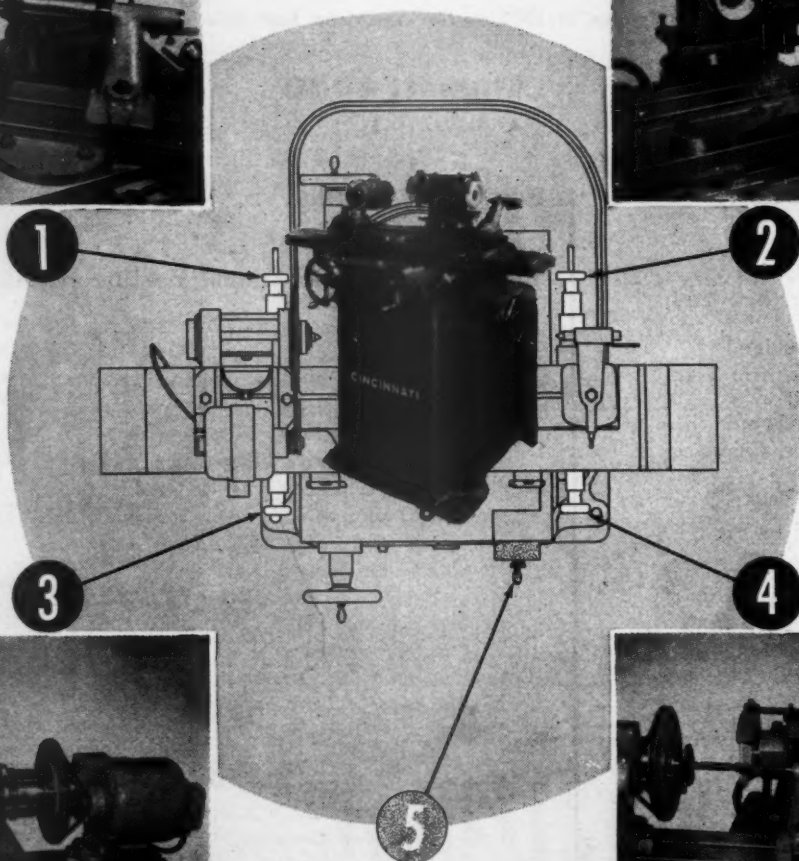
Index to Advertisers..... 168



1. Most cutters are ground while the operator stands or sits at this corner behind the table.



2. Many left-hand cutters can be ground to advantage from this operation position.

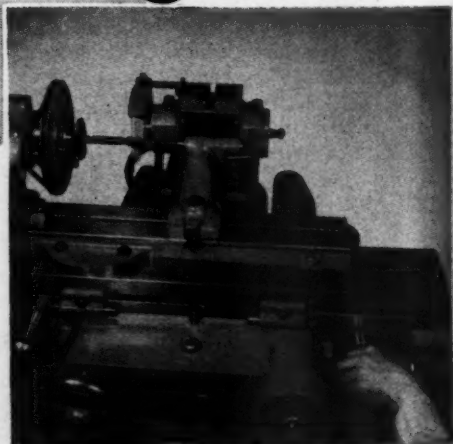


3. Internal grinding operations are in full view when the operator stands at this front table control.

4. This operating corner will be appreciated when grinding short cylindrical sections such as the grooves in hydraulic plungers.



Above: Top view, showing table control knobs Nos. 1, 2, 3, 4 and the slow hand table traverse crank, No. 5. A view of the CINCINNATI No. 2 Cutter and Tool Grinder is superimposed over the drawing. Complete data may be obtained by writing for catalog M-1618.



There are no NEUTRAL CORNERS

Like a lot of action in your machine tools? You can have it at every corner of the new CINCINNATI No. 2 Cutter and Tool Grinder. The drawing highlights the table controls, and the four photographs show how they are used. There are no neutral corners . . . the operator now has a choice of four control positions for the table. And there are other

new features which you can't afford to overlook:

- a. Built-in electrical controls
- b. Built-in oil-shot lubrication
- c. Additional vertical range of wheelhead

Would you like to know more about the new CINCINNATI No. 2 Cutter and Tool Grinder? Write for catalog M-1618.

THE CINCINNATI MILLING MACHINE CO.

CINCINNATI 9, OHIO, U. S. A.

MILLING MACHINES • CUTTER SHARPENING MACHINES • BROACHING MACHINES

Roy V. Wright Dies



Long editor of *Railway Mechanical Engineer*, he was a leader in widely diversified activities

ment of steel freight cars and took an active part in the electrification of the shops of that railroad.

In June, 1904, he began his editorial career, serving as associate editor of the *American Engineer and Railroad Journal* under the late George M. Basford. In November, 1905, he succeeded Mr. Basford as editor and continued in this capacity until February, 1910, when he became mechanical department editor of the *Railway Age Gazette*. In January, 1912, the Simmons-Boardman Publishing Company, publishers of the *Railway Age Gazette*, purchased the *American Engineer and Railroad Journal*, now the *Railway Mechanical Engineer*, and Mr. Wright again became editor of that publication, a capacity in which he continued until his death. In October, 1912, he was appointed also managing editor of the *Railway Age*.

In 1911 Mr. Wright was editor of the book entitled "Railway Shop Kinks" and since 1912 had served continuously as editor of the *Locomotive Cyclopaedia* and the *Car Builders' Cyclopaedia*. In 1921 he was also editor of the *Materials Handling Cyclopaedia*.

In addition to his editorial duties, Mr. Wright was a director, a vice-president, and secretary of the Simmons-Boardman Publishing Corporation. He was a member of the National Conference of Business Paper Editors, of which he was president in 1939-40, and during the succeeding year he was president of the Associated Business Papers, Inc.

His interest in the engineering profession was active and of long standing. He was a member of the Railroad Committee of the American Society of Mechanical engineers before the formation of the present Railroad Division and a member of the first Metropolitan Section committee. From 1919 to 1923 he was a member of the Meetings and Programs Committee, of which he was

ROY V. WRIGHT, since 1912 editor of the *Railway Mechanical Engineer*, and managing editor of the *Railway Age*, died at the East Orange General Hospital, East Orange, N.J., on July 9, following a heart attack at his home in that city on July 3.

Mr. Wright, baptized Royden Vincent, was born at Red Wing, Minn., October 8, 1876. He received his education in the St. Paul, Minn., public schools and at the University of Minnesota, from which he graduated with the degree of M.E. in 1898. Following graduation, he began his career as a machinist apprentice at the South Minneapolis, Minn., shops of the then Chicago, Milwaukee & St. Paul. Late the following year he left that road to become a special apprentice on the Chicago Great Western.

After serving as draftsman and chief draftsman of the Great Western at St. Paul, he resigned in March, 1901, to become mechanical engineer of the Pittsburgh & Lake Erie. Here he participated in the early develop-

chairman in 1921 and 1922. He served on the Finance Committee during 1926 and 1927. Mr. Wright was also one of the honorary editors of the Professional Divisions' reports on technical development since 1880 as published in the Fiftieth Anniversary Issue of Mechanical Engineering. He was elected a manager of the society for a term from 1922 to 1925, was vice-president in 1926 and 1927, and president during 1930-31. At the time of his death he was an honorary fellow of the society. Stevens Institute of Technology conferred upon him the honorary degree of Doctor of Engineering in 1931. In 1938-39 he served a term as president of the United Engineering Society.

Mr. Wright was a member of the Committee on War Memorials to American Engineers in Louvain, Belgium; a delegate to the first World Power Conference in London in 1924, and represented the American Management Association as honorary vice-president at the International Management Congress in Prague, Czechoslovakia, later that year. He was a member and had been chairman of the John Fritz Medal Board, which confers the highest award in the engineering field.

Among Mr. Wright's other activities, he was a member of the Advisory Board of the Department of Smoke Regulation of Hudson County, N.J.; trustee of the American Museum of Safety; had been a member of the National Safety Council, of which he was vice-president in 1941-42; a member of the Transportation Committee, of the Program Services Committee, and a former member of the Board of Publications of the National Council of the Y.M.C.A.; a director and vice-president of the

Y.M.C.A. of the Oranges; a member of the Silver Bay Industrial Conference Committee, of which he was chairman in 1936-37, and president of the Silver Bay Association. He long served as a member of the executive committee of the New York Railroad Club and was a member of the Franklin Institute and of the Newcomen Society.

Mr. Wright was author of the chapter on Transportation in the book "Toward Civilization," edited by Charles A. Beard. He also was co-author with his wife, Eliza G. Wright, of "How To Be a Responsible Citizen." Since 1935 he was lecturer on citizenship at the Newark College of Engineering.

Mr. Wright's political activities included membership in the "Engineers National Committee" which carried on a campaign in behalf of Herbert Hoover in the presidential election of 1932; a term from 1935 to 1937 as a member of the Board of Chosen Freeholders of Essex County, N.J., during which he was chairman of the Road and Bridge Committees, and two three-year terms as New Jersey State Senator. He declined to run for a third term in the fall of 1947. He was a member of the New Jersey State Republican Committee from 1940 to 1943.

Mr. Wright was a director of the Ampere Bank & Trust Company, and a member of the Arlington Avenue Presbyterian Church of East Orange which he had served in a number of official capacities, including the superintendency of the Sunday School during his early years in East Orange. He was a member of Beta Theta Pi, of Sigma Xi, and of Pi Tau Sigma (honorary).

Mechanical Division Annual Meeting at Chicago

Addresses by industry leaders and the 18 technical committee reports reveal the progress that has been made, as well as the increasing complexity of problems



J. M. Nicholson,
Chairman



A. K. Galloway,
Vice-Chairman



V. R. Hawthorne,
Executive Vice-Chairman

DURING the twenty-second annual meeting of the Mechanical division, Association of American Railroads, held at the Congress Hotel, Chicago, June 28 to 30 inclusive, five of the eighteen technical committee reports dealt with research projects to improve design or performance of mechanical equipment. The program also included addresses by J. M. Nicholson, assistant to the vice-president of the Atchison, Topeka & Santa Fe, the chairman of the division; by W. J. Patterson, a member of the Interstate Commerce Commission; by J. H. Aydelott, vice-president, Operations and Maintenance Department, A.A.R., and by Dr. H. T. Heald, president of Illinois Institute of Technology. J. M. Hall, director of the I.C.C. Bureau of Locomotive Inspection, gave an informal talk on Tuesday morning. W. T. Faricy, A.A.R. president, was introduced and spoke briefly during the Wednesday morning session.

At the conclusion of the session Monday afternoon, Georges C. Bohl, chief of the French Railway Mission, Washington, D.C., presented a paper and motion picture illustrating vividly the progress which has been made to date in rehabilitating French railways from the widespread and highly destructive effects of World War II.

Mr. Patterson discussed the status of outstanding orders for the installation of various types of devices on railway cars and locomotives and announced that consideration was being given to an extension of time beyond the end of 1948 in which to complete equipping freight cars with the AB brake. Mr. Aydelott stressed particularly the importance of improvement of journal-bearing conditions to reduce hot boxes and referred also to the critical liquid fuel supply as it affects the railroads. He paused during his address to announce the

approval by the board of directors of the A.A.R. of the building of a \$600,000 laboratory, which will be placed on the campus of the Illinois Institute of Technology at Chicago. Dr. Heald discussed the responsibility of industry generally and the railroads in particular in the matter of fostering the spread of technical education and the training of additional research workers.

During the meeting officers were elected to serve terms of two years. These were: Chairman, A. K. Galloway, general superintendent motive power of the Baltimore & Ohio, and, vice-chairman, J. E. Goodwin, chief mechanical officer of the Chicago & North Western. The retiring members of the



A. C. Browning,
Secretary



J. R. Jackson,
Mech. Eng.

General Committee were elected to succeed themselves for a two-year term expiring June, 1950. They are M. R. Brockman, assistant vice-president, Southern System; H. T. Covert, chief of motive power, Pennsylvania System; R. G. Henley, general superintendent motive power, Norfolk & Western; C. B. Hitch, chief mechanical officer, Chesapeake & Ohio, and J. M. Nicholson, assistant to vice-president, Atchison, Topeka & Santa Fe.

John M. Hall Talks About Safety

Mr. Hall reviewed some of the findings of the Bureau of Locomotive Inspection in its investigations of accidents and suggested some steps that could be taken to reduce the number of injuries and deaths sustained by employees. Those cases involving boiler explosions produced evidence, he said, that better instruction was needed in the action to be taken when low-water alarms operated, because they sounded so seldom that the crews did not know what to do when they heard the warning whistle. He believed that definite instructions should be issued giving permission to the engine crews to kill the fire when the water level was found to be low. Mr. Hall also thought that consideration should be given to the installation of quick-acting valves on water glasses in order that the pressure might be shut off quickly by crew members without being burned whenever a water glass broke.

In speaking of crankcase explosions in Diesel engines he said that the investigations showed that cover plates were being removed from hot engines too soon and the intruding

air combined with the hot gases to causes the explosions. He mentioned that one railroad had gotten good results by issuing instructions that a half-hour wait must precede the removal of cover plates on hot engines. In conclusion he pointed out that old locomotives must be maintained in a safe condition regardless of the fact that railroads expected to replace them with Diesels within a short period of time.

Railroads Improving—Faricy

Mr. Faricy, in a short informal talk, sounded an encouraging note as to the progress made by the railroads during the past year and the outlook for the future. While there is still no lack of troubles, particularly in getting enough steel to produce freight cars at the rate to meet the needs of the railways, he said that there was real hope for the attainment of the 10,000 freight-car-per-month goal during June. He also called attention to the fact that at the present time railways have more serviceable freight cars and passenger cars and better motive-power conditions than existed on Pearl Harbor Day. Earnings, he said, are definitely improving (the percentage return has improved steadily for the past three years), the railroads received a good break from Congress during the session that recently closed, and there is a growing appreciation on the part of the public of the essential character of the service rendered by the railroads and of some of their problems in meeting the demands of the public. The railroads have not broken down, he said, and they are not going to.

The General Committee Report

New research activities announced—The Division's work for the year reviewed

Application of AB Brakes

As of December 31, 1947, 1,427,566 railroad-owned and 147,375 private car line cars, or a total of 1,574,941 inter-

change freight cars, or 73.6 per cent, were equipped with AB brakes meeting the requirements of the specifications for freight brakes adopted in 1933. This was an increase of 165,639 cars equipped with AB brakes since December 31, 1946.



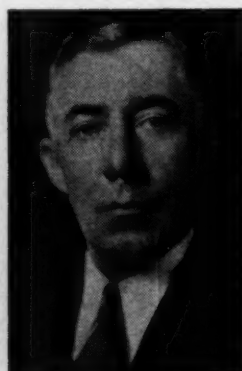
C. B. Hitch



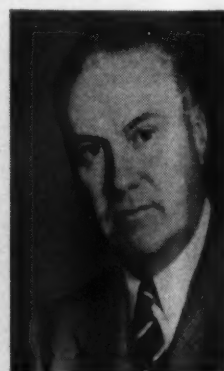
F. K. Mitchell



H. T. Cover



R. G. Henley



A. G. Kann



H. B. Bowen



J. E. Goodwin

**Mechanical
Division
General
Committee
A.A.R.**



B. M. Brown



J. Gogerty

A report covering the status of application of these brakes as of June 30, 1948, will be submitted as soon as the information can be compiled.

The final order of the Interstate Commerce Commission issued September 21, 1945, requires the installation of these brakes on all cars in freight service except those equipped with passenger car brakes, in accordance with the terms of its report May 30, 1945, on or before January 1, 1949. It is quite evident that in view of the present material situation, this goal cannot be attained. A number of railroads and private car lines are filing petitions with the I.C.C. for an extension of time within which to comply with the Commission's Order.

Car Design—Refrigerator Cars

The Refrigerator Car Research Bureau, which was organized in March, 1946, has carried on an intensive program of tests in co-operation with the United States Department of Agriculture and the shippers of various commodities to determine the efficiency and adequacy of the present designs of refrigerator cars from the standpoint of insulation thickness, general characteristics, and the employment of forced air circulation.

Reports on many of these tests have been completed and submitted to the members and others interested. Very shortly there will be issued reports on a number of other tests, including heat and water-vapor transmission studies, which contain much valuable information for the car lines as well as for the railroad.

During this year the refrigerator-car research program includes a number of tests, as follows:

- 1—A test on peaches from South Carolina or Georgia to New York, comparing forced air circulation in cars with other cars having no forced air circulation.
- 2—A hot-weather test on frozen foods from Modesto, Calif., east, using one car with 4 in. of insulation all around, one with 4-4½ in. of insulation, and one with 6-7 in. of insulation, all three cars to move with forced air circulation and to have reflective material applied to the insulation.
- 3—A short-haul frozen-foods test from Houlton, Me., to Newark, N.J., using cars equipped with air circulation.

Co-ordinated Mechanical Associations

Last year the Air Brake Association was revived and made a member of the Co-ordinated Railroad Associations because of the present-day importance of air brakes and air-brake instruction. It is the feeling of the General Committee that the re-establishment of the Air Brake Association and the discussions and reports from its committees and members will be of great value to the railroads.

Arrangement has also been made that in the future the Electrical Section of the Mechanical Division of the A.A.R. will be a part of the co-ordinated group of railroad associations so as to provide opportunity for the members attending the other meetings to also hear and take part in discussion of interest to them in connection with the maintenance of electrical equipment of Diesel locomotives, air conditioning, high-speed air-brake equipment, etc. In future years the electrical equipment manufacturers will exhibit at the co-ordinated conventions on alternate years with the Allied Railway Supply Association.

At a recent meeting of the Executive Committee of the Co-ordinated Associations, J. E. Goodwin was elected chairman and J. M. Nicholson was elected vice-chairman.

It is recommended that the mechanical departments of member roads support these associations by allowing their supervisory officers to accept appointments to membership on committees and to attend the annual conventions.

Loading of Lumber

The recommendations of the Special Committee on Lumber Loading agreed to by the shippers were placed in effect January 1, 1948. Reports to date indicate that these revised rules had been quite effective in improving the handling of this product to destination with a greatly reduced amount of trouble, adjustments or transfers en route.

The General Committee appreciates very much the work of this Special Committee on Lumber Loading and the splendid co-operation received from the shippers of this product.

Trucks for High-Speed Freight Service

Since the tests conducted by the A.A.R. Mechanical Division during 1938 and 1939, considerable development has been made in the design of freight trucks, including the application of snubbing devices, to prevent damage to lading from vertical and lateral shocks.

For the purpose of comparing and evaluating the snubber and freight-truck designs now available, negotiations with the manufacturers of these devices by the A.A.R. Mechanical Research Office during the past several months has resulted in the development of a co-operative research program. This program contemplates the use of the American Steel Foundries Service Laboratory equipment (five-car unit) and their trained technicians, under the general direction of the Mechanical Research Office. It is proposed to carry out a field testing program during 1948, at an estimated cost of \$65,000 to the railroads, and approximately \$160,000 to the equipment manufacturers. The plan agreed to by the manufacturers and the research office, collaborating with the Committee on Car Construction, contemplates a series of road tests to be carried out on the Illinois Central out of Clinton, Ill.

The program also contemplates a laboratory test program to evaluate the relative service-life of the devices qualifying as acceptable during the road test program. Corollary to the main objectives of the proposed research project are included the evaluation of long-travel truck springs compared to the present conventional design, comparison of the spring with the spring-plankless design of freight truck, and the effect of removal of the end collars of axles on the lateral movement of cars in transit. A comparison of the conventional solid type bearing with roller bearings for freight service is also to be included in the program.

This field-testing program, to be completed during the year 1948, has been approved by the board of directors of the association and will be started July 1, 1948.

Air-Conditioning of Railroad Cars

The American Society of Heating and Ventilating Engineers has a research organization to carry on basic research relating to heating, ventilating, and air conditioning. On invitation from that society to the A.A.R. Mechanical Division to participate in the activities relating to air conditioning which would be applicable to railway equipment, a joint committee was appointed during 1947 to study the A.S.H.&V.E. laboratory facilities in Cleveland, Ohio. As a result the committee recommended participation by the A.A.R. in four projects, as follows: (a) standardized test procedure for air filters; (b) studies dealing with solar-heat load in cooling and heating, and periodic heat flow through structural materials; (c) studies on the physiological adjustment of human beings to sudden changes in atmospheric environment; (d) studies dealing with the distribution of heated and cooled air and air friction.

The A.A.R. has approved the sum of \$4,000 as its portion of the expense of this project for 1948. It is contemplated that completion of the four studies will require from three to four years at an annual expense to the A.A.R. of approximately \$4,000 per year. This is an example of participation in organized research, the actual work of which will be progressed in existing laboratory facilities by trained personnel available for that class of research. A.A.R. participation will consist of representation on the steering committees responsible for each of the four research projects. These representatives will be looked to to give direction to the activities from the railroad viewpoint. The technical information developed as the work progresses will be made available to the Mechanical Division.

During the past year the field tests on two projects have been completed and reports are in preparation. These investigations covered the Impact Effect of Flat Wheels, conducted on the Chicago & North Western at Harvard, Ill., and the Intensity of Lateral Forces from Locomotives with Respect to Track Alinement, conducted on the Santa Fe rails at Cajon Pass, Calif.

Consideration is being given to the provision of enlarged office and limited new laboratory facilities to take care of the increased work of the research office.

1949 Meeting

In view of the prospective conditions with respect to hotel facilities for meetings during the year 1949, arrangements have already been made to hold the 1949 Annual Meeting of the Division at the Congress Hotel, Chicago, on Monday, Tuesday and Wednesday, June 27, 28 and 29, 1949.

Life Members

The following have been made Life Members of the Division, since June, 1947:

Date Joined	Name	Title and Railroad
1928	Becherer, F. H.,	superintendent car department (retired), Baltimore & Ohio.
1928	Bjorkholm, J. E.,	superintendent motive power, Chicago, Milwaukee, St. Paul & Pacific.
1928	Bowen, H. B.,	chief motive power and rolling stock, Canadian Pacific.
1928	Elsey, W. R.,	assistant vice-president, Purchases, Stores and Insurance, Pennsylvania.
1928	Gimpel, F. H.,	mechanical superintendent, Manufacturers Railway Company-St. Louis & O'Fallon.
1928	House, C. M.,	general superintendent motive power and equipment, Gulf, Mobile & Ohio.
1928	Lynch, G. G.,	assistant to chief motive power and equipment, Atlantic Coast Line.
1928	Miller, A. T.,	superintendent motive power, Georgia Western of Alabama.
1928	Rees, H.,	superintendent motive power, Baltimore & Ohio.
1928	Silfies, D. M.,	superintendent transportation, Buffalo Creek & Gauley.
1928	Spangler, P. F.,	assistant superintendent motive power St. Louis-San Francisco.
1928	Steins, C. K.,	mechanical engineer, Pennsylvania.
1928	Wilber, R. W.,	superintendent motive power and equipment, Detroit, Toledo & Ironton.
1928	Williams, H. W.,	division master mechanic, Chicago, Milwaukee, St. Paul & Pacific.

Obituaries

The secretary has been advised of the death of the following members since June, 1947:

Name	Title and Railroad	Died
Argast, H. C. (Life),	superintendent car department, St. Louis & O'Fallon-Manufacturers Railway	July 9, 1947

Barthelemy, P. P. (Life),	St. Paul, Minnesota	July 29, 1947
Brown, F. W.,	vice-president, Charleston & Western Carolina	March 14, 1947
Fisher, T. W.,	assistant engineer of tests, Pennsylvania	September 5, 1947
Flowers, A. J.,	master mechanic, Central of Georgia	January 13, 1948
Harding, E. N. (Life),	Lawton, Mich.	August 5, 1947
Harris, A. A. (Affiliated),	mechanical supervisor, New York, New Haven & Hartford	April 7, 1948
Helbig, O. H. (Life),	North Prescott, Ark.	December 17, 1946
Hunt, Robt. (Life),	Berkley Machine Works & Foundry Co.	November 26, 1947
Huston, F. P. (Affiliated),	in charge railroad developments International Nickel Company	December 29, 1947
Imgrund, G. W. (Life),	vice-president, Chicago & Illinois Midland	April 5, 1948
Laughlin, G. F. (Affiliated),	Chicago	August 29, 1947
McGoff, H. M. (Affiliated),	Fort Madison, Iowa	July 4, 1947
Needham, H. L. (Life),	Chicago	April 16, 1947
Propst, C. F. (Life),	Attica, Indiana	July 31, 1947
Sanchez, Jose,	master mechanic, Vera Cruz Terminal Company	October 6, 1947
Schultze, R. W. (Life),	Santa Ana, Cal.	March 3, 1947
Whitford, W. S. (Life),	915 Fifth street, Boone, Iowa	
Wiley, Dean F.,	vice-president-operating, maintenance & engineering, New York, New Haven & Hartford	January 23, 1948
Willhide, G. O.,	general master mechanic, Western Maryland	August 25, 1947

The report was signed by, J. M. Nicholson (chairman), assistant to vice-president, A. & S.F.; A. K. Galloway (vice-chairman), general superintendent motive power and equipment, B. & O.; C. B. Hitch, chief mechanical officer, C.O.; F. K. Mitchell, general superintendent motive power and rolling stock, N.Y.C.; H. T. Cover, chief motive power, Pennsylvania; M. R. Brockman, assistant vice-president, Southern; R. G. Henley, general superintendent motive power, N. & W.; A. G. Kann, general superintendent equipment, I.C.; H. B. Bowen, chief motive power and rolling stock, C.P.; J. E. Goodwin, chief mechanical officer, C. & N.W.; B. M. Brown, general superintendent motive power, Sou. Pac.; John Gogerty, general superintendent motive power and machinery, U.P.

The Work of the Mechanical Division

By J. M. Nicholson

Chairman, A.A.R. Mechanical Division

Almost three years have now elapsed since V-J Day and we find economic conditions in this country far from being settled. Transportation agencies in general, and the railroads in particular, are trying desperately to re-establish themselves on a substantial economic basis, and at the same time maintain a state of preparedness for any eventuality.

The part which railroad mechanical department officers and employees must take in these readjustments is an important one. Its importance stems chiefly from the fact that mechanical departments are generally the largest spenders of railroad funds. Maintenance-of-equipment expense on a representative railroad averages approximately 20 per cent of total operating expenses. Enginehouse expense, locomotive supplies and lubricants collectively represent approximately 3 per cent, making a total of 23 per cent of the total operating expense for which the mechanical department is definitely responsible. In addition to this responsibility, the

mechanical department assumes a large share of the responsibility for reducing fuel costs, which alone amount to approximately 10 per cent of the total operating expense.

All together, it is fair to assume that the mechanical department is directly or indirectly responsible for about one-third of the total operating expenses of the average railroad.

What the Mechanical Division Does

The purpose of the A.A.R. Mechanical Division is to serve as a clearing house for mechanical department officers to assemble and disseminate information that will help them discharge their responsibilities more efficiently and enable the railroads to earn more by giving better service at minimum expense. It is hoped that the upward trend of material prices, taxes, and wage rates will soon be checked, but there seems to be little hope of any major reductions in the near future. Economies in railroad operation must, therefore, be

obtained through the design, construction, and use of better equipment and the use of improved methods for getting things done.

We saw at Atlantic City last year a magnificent exhibit of better equipment and better tools with which to work. It is unfortunate that not all of our members were able to see these exhibits and study them for themselves. These exhibits represent the contributions of the equipment builders and railway supply men toward better and more economical railroad operation.

In addition to the development work represented in these exhibits, the association has been carrying on for a number of years an extensive program of research in certain fields which, in most cases, have been too large to be covered by the research organizations of individual member roads or manufacturers. The purpose of these research projects has been to attract more business to the railroads, improve railroad operations, and minimize railroad costs. The total amounts appropriated by the A.A.R. Mechanical Division for research projects during the eleven-year period 1938 through 1948 total \$1,377,500, as shown in the table.

A.A.R. Mechanical Division Research Appropriations		
1938	.....	\$ 62,500
1939	.....	52,000
1940	.....	70,000
1941	.....	145,000
1942	.....	123,000
1943	.....	93,500
1944	.....	88,000
1945	.....	112,500
1946	.....	151,000
1947	.....	183,000
1948	.....	297,000
		<hr/>
		\$1,377,500

Some of the outstanding research projects of former years relate to air brakes for freight and passenger cars, also

couplers and draft gears for cars and locomotives. (Mr. Nicholson here referred briefly to axle research which has been in progress since 1937; crank-pin and axle research, organized early in 1938, and to other projects which the Mechanical Division now has under way, including hot-box alarm devices, brake-beam design, air conditioning of railroad cars, car journal lubrication, journal-bearing development, geared hand brakes, journal-box lids, and refrigerator-car design.—EDITOR.)

Joint Research Activities

In addition to the above research program in which the Mechanical Division is chiefly interested, an extensive research program has been carried on for a number of years by a joint committee consisting of representatives of the Engineering and Mechanical Divisions. The attention of this joint committee has been devoted to the relations between track and equipment. The activities of this committee have consisted largely of field tests of locomotive counterbalancing, impact effect of flat wheels, relation of wheel diameter to permissible wheel load, and intensity of lateral forces from locomotives with respect to track alinement.

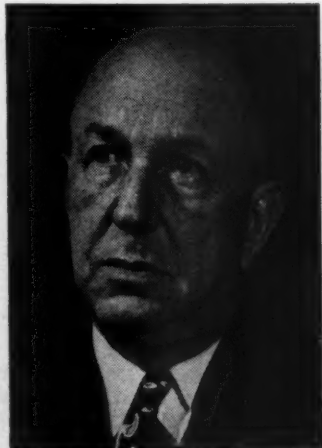
All of the research projects mentioned have been carried on with the participation of the various interested committees of the Mechanical Division. In view of the wide scope of recent developments in railroad equipment, some of the committees have been reorganized and augmented in personnel so as to better enable them to cover the subjects assigned. Some of their reports will deal with research projects. Others will present information which has been collected from various sources or developed within the committees themselves. Our committees have worked diligently throughout the year and deserve credit for the manner in which their reports have been compiled.

Research Is Finding Some of the Answers

By J. H. Aydelott

Vice-President, Operations and Maintenance Department, A.A.R.

There is gratification over the increased number of new freight car units and new locomotive units which have been placed in service since the last session in Atlantic City. The number of new cars installed began to exceed retirements only last December. Freight car output, however, is not up to



J. H. Aydelott

expectations and we are fearful that it may lag to some further extent in the third quarter, reflecting suspension of full scale operations by the steel mills due to the stoppage of coal production earlier in the year. The demand for steel, while still unsatisfied, is perhaps a little nearer to production than it has been at any time since

the war ended. However, there are ambitious programs under consideration for other elements in our economy, which, if adopted even in part, may make it more difficult as time goes by to secure for the railroads the quantities of steel which they should and must have for their diverse uses and to make up past deficiencies. No one knows yet what the full effect of the European relief program is going to be on steel. Of further concern is the question of how much lumber will flow into that program. It is our purpose at association headquarters to keep as well informed as possible about these programs and should we believe any of them to be inimical to the interests of the rail carriers we shall take whatever action is indicated in an effort to keep the needs of the railroads for materials and supplies constantly to the forefront to prevent any ground being lost and to improve our situation if we can.

Research a Large Factor

The worth and influence of the Mechanical Division to the growth of our rail transportation systems to the present state of efficiency cannot be overstated. The unfortunate part about the whole matter is that the general public cannot appreciate all that has been done as to those details of design and construction which feature the rolling stock and the physical properties of our railroads today. Research has been a large factor. This activity as it concerns our rolling stock is nothing more than a trial and error determination of whether new designs and construction are better than the old and, if they appear better, to demonstrate their worth in exacting service tests.

Research must go on. Programs for each succeeding year

seem to indicate more productive results and they are creating greater interest. Railroad managements are intensely interested in research as is witnessed by the approval of the expenditures of large amounts for such tests as this year involve freight trucks, refrigerator cars, journal bearings, air-brake equipment and the like.

Railway executives have made inquiries recently as to progress being made in studies and activities which seek the elimination or at least a marked lessening of the hot-box hazard. Some of these officers have gone so far as to suggest that the recommended specifications applying to journal packing should be made a condition for interchange requirements. I am sure that not all of this hot-box trouble stems from the lack of proper lubrication. Research activities which we are conducting in an effort to develop better-riding trucks; campaigns to secure a proper regard for specifications applying to wheel and axle construction and mounting, and better shop practices made possible by modern tools are expected to contribute to lessening the hot-box problem.

Not only must we find the remedy for overheated bearings because of the hazard which a burnt-off journal creates to the train itself and to other trains which may be passenger-carrying trains, but because our investment in the individual car today is so large that we can ill afford to have it and other cars destroyed and their contents scattered over the right-of-way as is a possibility when a journal failure occurs. Further, our car supply is not sufficiently adequate that we can continue to have these recurring losses.

Maintenance-of-way people believe that anything done toward improving the riding qualities of trucks under freight and passenger cars through better design and through the elimination of out-of-round and out-of-tram wheels and imperfect axles will lessen the wear and tear on track and structures, reduce maintenance costs and increase the life of the material involved. These are results the accomplishments of which constitute a formidable challenge to the Mechanical Division.

What About Fuel Oil?

You are all familiar with the growing consumption of petroleum products in this country and the problems of supply and distribution which have accompanied it. There is a national interest in the petroleum situation, particularly as to the adequacy of our national resources of oil to meet future needs both in time of peace and in time of war.

Consumption of petroleum products by the railroad industry involves almost every department. Mechanization of roadway and station operations and a growing use of motorized equipment for handling men and materials have aided the railroads in their efforts to overcome increased wage and material costs. The use of petroleum products has been distributed more widely over railroad lines since the Diesel locomotive came into widespread use. The grade of oil which these locomotives have been using is getting into a strongly competitive position arising from a growing demand for light oils for industrial uses and for the heating of homes and other buildings. Then there is the unknown demand that will arise from a greatly expanded air force which will include many jet-propelled planes known to be extravagant in the use of oil and of the grade with which we are most concerned.

The situation clearly calls for the closest possible cooperation between the railroads and the manufacturers of Diesel locomotives, since the industry will be under the necessity of continually seeking means of securing the greatest possible economy in the use of oil, particularly of the grade to which I refer. Some experimental and perhaps some rather extensive use of a lower grade of oil than that heretofore used on Diesel locomotives has been made and it is hoped that the results obtained will indicate that a lower grade of oil may be used without lowering the efficiency or output of the locomotive.

Whatever may have prompted concern about the future adequacy of our national oil supply, one might readily find the answer in the huge output of commercial and private motor vehicles, approximately 5,000,000 units in 1947 with a goal exceeding that number in 1948. Additionally, automobiles and trucks of foreign manufacture

are appearing on our markets and the use of planes is expanding now to include freight carriers whose fuel consumption is enormous for the load carried. Suspicion seems to have been voiced in some quarters that shortages of oil may be connected with the increased Dieselization of railroads but such a conclusion is not supported by reports which show the actual consumption of all fuel oil by locomotives as less in 1947 than in 1945. Consumption should further decrease if Diesel locomotives continue to supplant oil-burning steam locomotives, which seems to be the trend.

Russia and Its Railways

Since we hear so much about Russia, I think you will be interested in learning something about what that country is doing with respect to its railways. In 1946, the Soviet Union embarked on its fourth Five-Year Plan. An important part of that plan has to do with the rehabilitation and expansion of their system of railroads. From 1946 to 1950, Russia expects to spend 40 billion 100 million rubles, more than 2 billion 100 million American dollars, on its railroads.

Their equipment program provides for the acquisition of 6,165 long-distance steam locomotives, 555 electric locomotives, and 865 Diesel locomotives. The car program over the five-year period involves 472,500 new freight cars and about 6,000 new passenger coaches.

Russia attaches great importance to rail transportation for its industrial development, and it evidently has no intentions of permitting an inadequate railroad system to defeat its plans for industrial expansion.

American Standard World-Wide

Other than in the United States there are few railroads throughout the world that remain in private ownership and under private management. Those in the war-ravaged countries as with Russia face large expenditures for rehabilitation.

Throughout the world American standards of construction and our operating and maintenance practices are being copied. Today there are representatives from several foreign nations surveying American railroads in order that they may confer with our people and see first-hand the things which made it possible for our railroads during the recent war to produce so much transportation with facilities and equipment considered adequate only for normal peacetime requirements. They will find the answer in the determination of our railroad systems to keep their plants progressively modernized regardless of whether income was adequate or far below needs. They will find also there is no substitute for a competitive system which is a product of free enterprise without which our railroads could not attain and hold the position which they enjoy today in the world of transportation and in the esteem of the general public.

Inform the Public

The people of this country expect their railroads to be ready for any emergency which might arise. Yet, many things are being done that have the effect of weakening the railroad position.

All other forms of transportation have subsidies of one kind or another. It is quite possible, therefore, that the railroads in the necessity of meeting constantly rising costs of labor and materials have carried through a succession of offsetting rate increases only to find that they may have priced themselves out of the transportation market. We must therefore, as railroad men, take advantage of every opportunity which presents itself to voice our situation before the public.

This nation can have a system of railroads which will cope with any future emergency only if it adopts and enforces constructive policies that will insure fair treatment of the railroads not only because they are an important element in our national economy but because in time of emergency they must attain peak capacity which they cannot do if peacetime earnings are inadequate to support expansion and modernization programs.

Some Current Safety Problems

By The Hon. W. J. Patterson

Member, Interstate Commerce Commission

It has been a pleasure for me to work with your General Committee in dealing with matters of common concern. I like your record in many respects, but am somewhat alarmed in others.

Under our order of September 21, 1945, in Docket No. 13528, the time within which freight cars are required to be equipped with AB brakes expires at the end of this calendar year. Although the investigation which resulted in the



W. J. Patterson

adoption of the order of September 21 was instituted in 1922 and the AB brake was made standard by this division in 1933, it is obvious that an extension of time beyond the end of this year will have to be made within which to equip some of the cars not now equipped.

Time Extension for AB-Brake Applications

The commission is now giving consideration to this matter. A notice to that effect has been circulated to interested carriers and your General Committee is now requested to give our notice as much publicity as necessary. The extension order may not be issued until we receive the report from you showing the status of the several carriers as of June 30 this year. In the meantime, it is requested that individual railroads refrain from asking for relief.

As soon as a sufficient number of freight cars have been equipped with this improved brake to handle the business of the country the non-equipped cars should be retired from service or set aside until they have been equipped.

The effective date of our order of January 16, 1946, requiring the application to road locomotives on or before June 1, 1948, of feedwater-tank indicators, auxiliary power-reverse-gear connections, and emergency brake-pipe valves, has been extended by order of April 27, 1948, to not later than when the locomotives receive Class 3 or heavier repairs. The locomotives subject to the order should, of course, be equipped as promptly as possible.

Boiler Explosions

Boiler explosions caused by overheated crown sheets are the most prolific source of locomotive accidents that result in deaths and permanent injuries. There are now in use devices for the purpose of avoiding or minimizing the effects of such crown-sheet failures. Among these are devices to improve the water circulation, low-water alarms, and soft plugs. Our records indicate that at least some of the enginemen have not been properly instructed with respect to the use and functions of these devices and that in some instances the crown sheets have not been fully protected by the devices that were installed.

It seems manifest that whatever device is installed to avoid

these failures, the installation should be complete and adequate for the purpose and the men who are to work with it should be fully instructed with respect to its use and functions.

The Load Compensating Brake

At the present time the Association of American Railroads requires that all freight cars, except refrigerator cars, offered in interchange with single-capacity brakes shall have a nominal braking ratio of not less than 50 per cent nor more than 75 per cent of the empty car weight, based upon 50 lb. brake-cylinder pressure. The recommended practice calls for a minimum braking ratio for new freight cars of 18 per cent, preferably 20 per cent of the gross rail load, based upon 50 lb. brake-cylinder pressure.

This minimum braking ratio is entirely too low. The unequal braking, ranging from 18 to 75 per cent of the gross car weight, leads to destructive shocks and excessive slack action in long trains. The operation of heavier and longer trains at higher speeds obviously causes longer stopping distances, rougher handling of trains, and, under certain conditions, with minimum permissible braking ratio on the whole train it might result in control of a train being lost entirely.

What is thought to be a practical load-compensating brake for freight cars has been developed and is now in experimental service. Arrangements for road tests of this brake during the summer months are now being completed. If this brake is found satisfactory, it should promptly be made standard equipment and required to be used on all freight cars when necessary to secure a proper braking ratio for the loaded car.

Recent developments in material and design indicate the probability of a much needed improvement in freight-car brake beams and attachments. Train accidents reported to the commission as a result of brake beams and associated parts rose from 279 during 1946 to 309 during 1947.

Hot Boxes, Axles, Wheels

As the length and speed of freight trains continues to increase, the detection of hot boxes by train and engine crews becomes more difficult and the consequences of journal failure more costly. The number of train accidents as a result of journals failing due to overheating as reported to the commission rose from 375 during 1946 to 421 during 1947. This indicates the need for further development of methods of hot-box detection and improved materials and practices in regard to journal-box lubrication.

The number of train accidents due to wheel and axle failures continues to increase. The annual average of such accidents for the five years 1940 to 1944, inclusive, was 1,314. During 1947 1,664 such accidents were reported.

With increased tonnage and speed, this problem will become more important. It is one which requires thorough consideration.

The number of train accidents reported to the commission as a result of draft-rigging failure also shows a marked increase. During the five years, 1940-1944, inclusive, the average annual number of train accidents reported due to this cause was 255. During 1947, 447 such accidents were reported. This increase indicates a need for prompt corrective measures.

Before closing, let me refer to the signal inspection act as it affects the Mechanical Division. Your president has found that the Mechanical Division, the Operating Division, and the Signal Division each has a vital interest in the operation of this law. There has, therefore, been created in the association a joint committee on train operation, control and signals upon which this division is represented. I am confidentially looking forward to the same cooperation from this committee that the commission has received from this division.

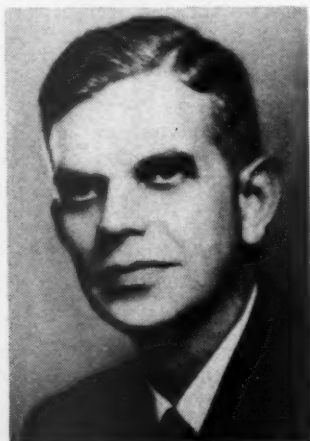
Railroads' Responsibility For Education

By Dr. H. T. Heald

President, Illinois Institute of Technology

The success the mechanical department officers have in achieving the goal of giving better service to the public will be determined largely by the ability of the railroads to attract and retain highly qualified engineers and research workers and to provide the kind of an environment in which they can produce the best results. Because the sources of such men are the colleges and universities, Mr. Heald observed that the railroads have an important stake in higher education in general and in engineering education and scientific institutions in particular.

In 1947 the college enrollment soared to an all-time high of 2,300,000, more than half of whom were veterans. Al-



H. T. Heald

though the peak of veterans' enrollment is expected to be reached before 1950, if the long-term trends continue, college enrollment may well be maintained at a figure in excess of three million. The increased percentage of students taking engineering courses (above ten per cent today as compared with six per cent before the war) does not presage any surplus of engineers and scientists, in his opinion, because the percentage of these men in our employed population will continue to rise in our technological world.

The growing tendency is to shift more of the responsibility for the support of college students—and indeed the universities themselves—to the federal government. While certain types of research are a responsibility of the federal govern-

ment, industrial research is clearly a task for industry. The central direction of the country's scientific investigation is a dangerous procedure; the alternative is greater support from industry, a responsibility that he thought industry has accepted only on a small scale. Continuing, Dr. Heald spoke in part as follows:

What the Railroads Can Do

The railroads can place a greater emphasis upon and show a greater appreciation of research. Money, indeed, is important; but money does not automatically produce research results. The facilities, the proper organization, and the men to do the research are vitally important. I do not doubt that today among the nation's railway leaders we have a sufficient amount of thinking and talking for scientific and technological development, but thinking and talking will never do the job without tools, men, and tireless application. I think there are important opportunities for the railroads to improve their research programs through individual and joint action, with great profit to themselves and to the public.

Again, the railroads can take more and more of their personnel from the colleges. The supply of college men will soon be more adequate, and the competition for these men then will not be nearly as great. However, if the railroads wish to obtain their share of the best of these men, they must offer opportunities, working conditions, and salaries comparable to those in other industries. Specialized courses in railway engineering are not needed to prepare men for the industry. The railroads need first-class graduates of the various modern engineering and scientific curricula.

Proposes Scholarship Program

Perhaps the best way that the railroads can be certain that they will obtain a fair share of the better college men is to adopt the plan now used by a number of firms—to conduct a search for talent in our high schools and college and then encourage and give financial support to these promising young people while they are receiving their training. I should like to propose that the railroads jointly sponsor a nationwide competitive scholarship program to provide college scholarships for young men selected on the basis of their ability and capacity for scientific and engineering study. Such a program properly developed, would stimulate interest in the industry and provide educational opportunities for excellent young people. A relatively small expenditure of money would have great public relations value.

Report on Locomotive Construction

Emphasis increased on the standardization of parts — Progress of gas-turbine locomotive development

It was recommended that the following proposals be submitted to letter ballot for their adoption as recommended practices:

Separate the drawings for piston rod and piston head, in lieu of the present combination drawing facing page 108 section F of the Manual.

Proposed dimensions for three grooves and eight rings for piston valves which will fit the majority of locomotives reported.

An alternate disc nut for all valves that provides more metal diametrically in the shoulder of the nut by increasing slightly the across flats dimension and by changing from a hexagonal shape to a circle with four flats.

Steam Locomotives

WELDED BOILER DESIGN

As of April 1, 1948, the status of fusion-welded locomotive boilers is as follows:

Railroad	Type of Locomotive	Number
Delaware & Hudson.....	2-8-0	1
Canadian Pacific.....	4-6-2	2
New York Central.....	4-6-4	1
Delaware & Hudson.....	4-6-6-4	1
Chesapeake & Ohio.....	2-8-4	5
Chicago, Milwaukee, St. Paul & Pacific.....	4-8-4	10
Chicago & North Western.....	4-6-4	6

The C. & N.W. have four of their all-welded boilers in service; the other two will be applied soon. The C.M. St. P.

& P. have three in service. The remaining boilers will be placed in service shortly. In addition to the above all-welded boilers built since 1937, the C.M.S.P.&P. have ordered six more boilers for their 4-8-4 locomotives to be delivered as required. The N.Y.C. have had 24 welded shells built for their 6,000 class 4-8-4 locomotives.

From the above, it can be noted that the construction of all-welded boiler has progressed considerably since the first all-welded boiler was built in 1937, this being due, no doubt, to the trouble-free service being obtained from this type of construction, as compared with the conventional riveted type boilers.

LATERAL FORCES ON CURVES

Under the direction of the Joint Committee on Relation Between Track and Equipment, the Mechanical and Engineering Divisions of the A.A.R. have completed a field test of a Santa Fe 4-8-4 passenger locomotive near San Bernardino, Calif., to determine the intensity of forces exerted laterally on the rail of curved track under various arrangements of truck resistances at comparatively low speeds. Since truck resistances have a considerable bearing on the relative stability and riding qualities of a locomotive, the engine was also tested on tangent track at high speeds with each arrangement of truck resistances studied.

The engine used was No. 3784, one of ten Baldwin locomotives of the Santa Fe 3776 class. It has Timken roller bearings on all axles and side rods, 80-in. drivers and 11/16-in. lateral motion each way in the front drivers. It is rated at 3,800 hp. at 77 m.p.h.

The truck resistances used in this class of engine are 20 per cent initial and constant in the engine truck, and 15 per cent initial and constant in the trailer truck. For the purpose of studying the effect of various combinations of truck resistances, special castings were obtained by means of which the engine-truck resistance could be set at 10, 20 and 30 per cent and the trailer resistance varied in the same values. With three resistances available in each truck there was, therefore, a possibility of nine different combinations.

In addition to Santa Fe No. 3784, two Union Pacific steam locomotives of the 800 class and one Southern Pacific 4400-class 4-8-4 types were submitted for single-day tests. These engines were not equipped with accelerometers so that no tests were made at high speed on tangent track, but since they differed somewhat from Santa Fe No. 3784 with respect to the truck resistances and lateral motion in the drivers, it is believed that the track records obtained would be of value to the study. Runs were also made on the test curve with Santa Fe 2-10-4 No. 5025.

The test of Santa Fe No. 3784 comprising track data from 5 to 30 m.p.h. and locomotive data from 5 to 100 m.p.h. is being analyzed to develop:

- 1. Effect of track resistances in all combinations on (a) forces against each rail, (b) movement of rail head, and (c) stresses in rail web fillets.
- 2. Effect of engine speed under above resistance conditions.
- 3. Effect of variations in the front-driver lateral motion.
- 4. Riding qualities of the test locomotive under the same conditions of truck resistance with respect to high-frequency oscillations and low-order lateral movement of the engine bed with respect to the track.

The data obtained from tests of the U.P. and S.P. 4-8-4's and the Santa Fe 2-10-4 locomotives will be completely analyzed along the same lines except that no analysis can be made of the riding qualities as these engines were not equipped with the necessary instruments. The mass of data accumulated from records taken of Diesel and steam power operated over the test curve in regular service will be scanned and if there appears to be any unusual conditions radically different from those developed by the test locomotives, these will be completely analyzed.

Diesel Locomotives

In the 1947 report the results of a survey on performance statistics were given in which the figures showed such wide variance that they had little or no significance. Because the reports were not on the same basis and all railroads do not follow identical procedure in reporting costs or calculating

the costs per unit of service, it is questionable whether this or any survey can produce results which will be of value to the membership. Because of variation in operating conditions in the several sections of the country, it is doubtful whether statistics gathered on a nation-wide basis can be properly compared.

It is the recommendation of this committee, therefore, that this subject be dropped and the docket closed.

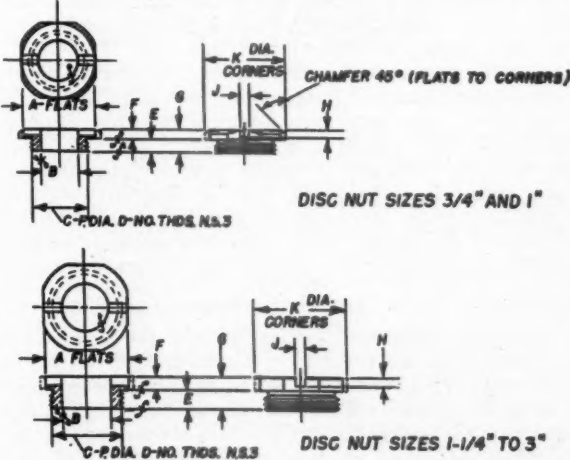
STANDARDIZATION OF PARTS

In the 1947 report a recommendation was made to adopt as Recommended Practice for Diesel Switching Locomotives of 600 to 1,000 hp.:

- 1. A standard axle 6 1/2-in. by 12-in.
- 2. Two journal bearings for this axle.
- 3. Essential dimensions for an interchangeable truck.

These recommendations were made primarily as a test to determine whether there was a definite interest in the standardization of parts for Diesel locomotives. All of the recommendations were carried, item one without dissent, and items two and three by large majorities. The comments offered in connection with the negative votes were of considerable value to the committee and some of them were incorporated into the drawings to be printed in the Manual as editorial changes.

Some exception was taken to the inclusion of two styles of journal bearings. It was suggested that Style 1 which closely follows the general dimensions of the A.A.R. car journal bearing be retained, and Style 2 which covers a special bearing be eliminated. Style 2 was included because a large number of 600- and 1,000-hp. switching locomotives employing this bearing are now in service. The use of this bearing and the journal box adapted to contain it do not affect the fundamental idea of an interchangeable truck for these locomotives. It was thought desirable, therefore, to



Valve Size, in.	A		B		C		D
	Max.	Min.	Max.	Min.	Max.	Min.	
3/4	1.031	.760	.756	.936	.933	.20	
7/8	1.219	.889	.865	1.089	1.085	.18	
1	1.375	.916	.912	1.183	1.179	.18	
1 1/4	1.563	1.010	1.006	1.308	1.304	.18	
1 1/2	1.844	1.104	1.100	1.422	1.418	.14	
2	1.969	1.213	1.209	1.563	1.558	.14	
2 1/2	2.250	1.385	1.381	1.829	1.824	.14	

Valve Size, in.	E		F	G	H	J	K
	Max.	Min.					
3/4	.203	.199	.156	.359	.125	.156	1.125
7/8	.313	.309	.156	.469	.125	.156	1.313
1	.313	.309	.219	.531	.156	.156	1.500
1 1/4	.375	.371	.250	.625	.156	.188	1.688
1 1/2	.438	.434	.281	.719	.188	.250	2.000
2	.438	.434	.281	.719	.188	.250	2.125
2 1/2	.500	.496	.281	.781	.188	.250	2.438

Note: All dimensions shown without a maximum and a minimum have a + or - .031-in. tolerance.

Alternate disc nut for all valves

show the Style 2 as an alternate. It was the hope of the committee that any newcomers into the field would adopt Style 1 as preferred.

The item of essential dimensions for an interchangeable truck was illustrated by a drawing which covers the trucks essentially now used by three of the major builders of locomotives of this size and type. No attempt was made to outline a complete truck frame, but merely outline the dimensions necessary to make the truck interchangeable. A truck frame either fabricated or cast could be built to these essential dimensions with the result that many details could be used, even though the traction motors, which are the only reason for differences, were not interchangeable.

The sketch shows the openings in the transom for the ventilation of the traction motors, as used by the three major producers of traction motors. A suggestion was made that a single opening with the largest area be shown. As a result of this suggestion, an addition has been made to the sketch which encompasses all three of those originally shown, and requires only the use of an adapter plate to use any one of the three motors.

The other principal dimension which varies as between the three makes of traction motors concerns the motor nose-suspension lugs. A suggestion was received that the shortest lug only be shown so as to allow for the use of the largest motor, and for the smaller motors additions would be made. It was thought more desirable to approach this from the other direction and provide the longest lugs for the shortest motors, and simply cut off material for the largest motors. Thus a number of castings could be ordered for stock and readily adapted for any of the motors now generally in use.

As previously indicated, no details are shown, and one of the suggestions was to the effect that the spring pocket be made ample to permit leeway in selecting the coil spring diameters. The commercial castings available have spring pocket of such size that most any practicable diameter of coil spring can be accommodated, suitable shim cups being used to maintain proper alignment.

As pointed out in last year's report, the truck frame such as contemplated makes it possible to standardize axles, wheels, journal boxes, bearings, and wedges, and, for locomotives of equal size and weight, the semi-elliptic and coil springs. With standard location of brake-rigging lugs and brake-cylinder pads, brake rigging can be largely standardized. The committee has before it the details listed above with a view toward presenting them to the Association as Recommended Practice to further the matter of standardization.

CLASSIFIED REPAIRS

Considerable space was devoted to this subject in the 1947 report, and from the discussion which ensued, it was quite obvious that at this time there is no preponderance of opinion that there is a need for an outline of classified repairs to Diesel locomotives. The matter was laid before the Committee on Locomotive Construction as a whole and it was decided

to table the subject pending its revival if and when experience shows that this procedure would be desirable.

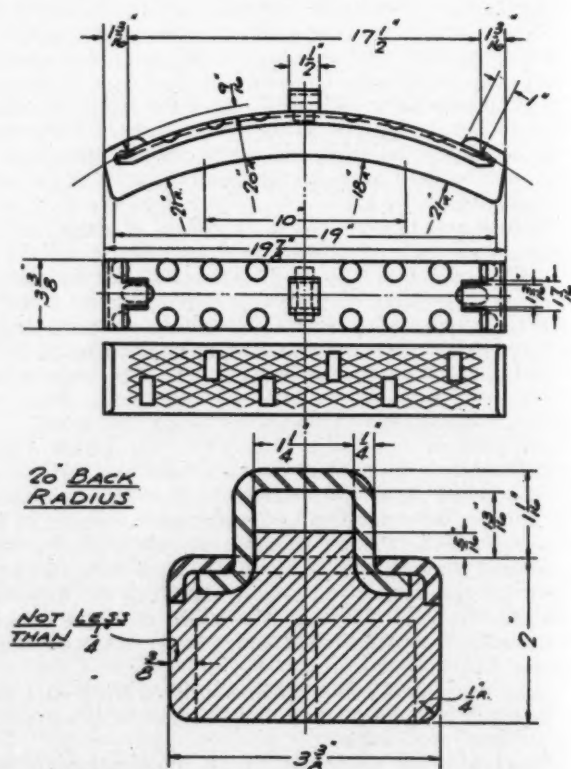
FIRE PROTECTION

The committee had further contacts with the Fire Protection and Insurance Section on the subject of fire protection. There is still a difference of opinion as to the matter of providing a definite amount of water, with foam for combating fires underneath the locomotives.

As far as the Mechanical Division is concerned, there is no objection to providing the water, if it is possible to find room for the necessary tanks and equipment. The direction of effort for the coming year will concern the possibility of finding a suitable substitute for the water acceptable to both of the divisions involved.

DIESEL LOCOMOTIVE BRAKE SHOES

Investigation was made of the possibility of reducing the stock of brake shoes required for Diesel road locomotives by compromise-radius brake shoes, using an unflanged shoe



Proposed unflanged car shoe with a 20-in. back radius for Diesel road locomotives

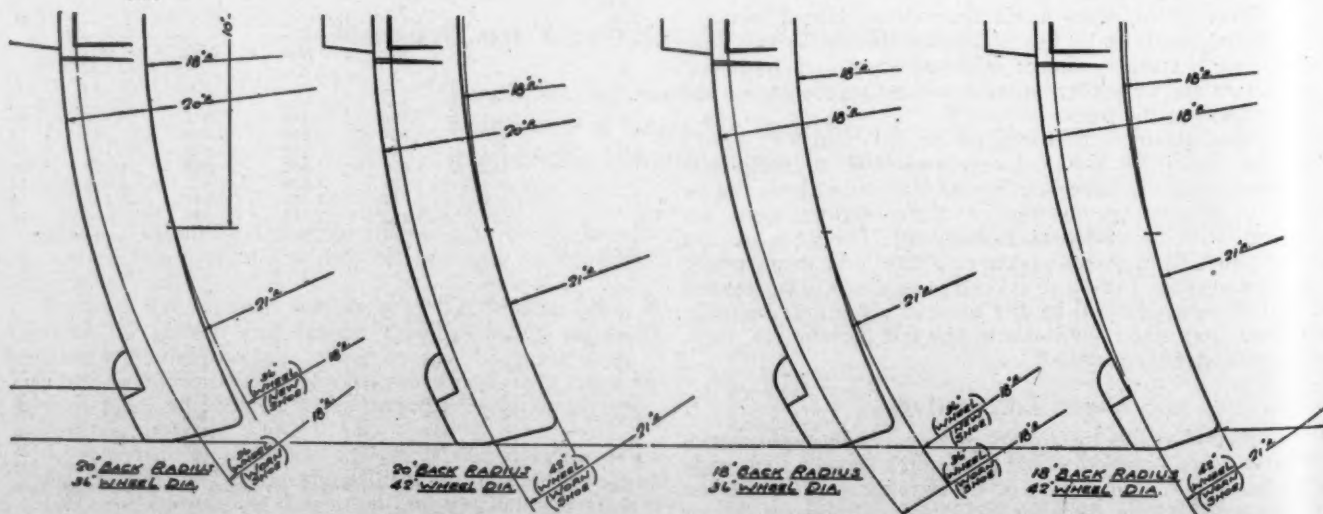


Diagram showing new and worn conditions on the compromise radius brake shoe

with an 18-in. back radius and compromise face radii for wheels from 36 to 42-in. in diameter, or a similar shoe with a 20-in. back radius. If the compromise-face shoes are used, there is an advantage in the use of brake heads with a 20-in. face and shoes with 20-in. back radius, since the average wear is more uniform, and less scrap should result. Railroads using long shoes on high-speed trains will recognize that the shoes illustrated are also usable on such cars.

AXLE DESIGNATION OF ELECTRIC AND DIESEL-ELECTRIC LOCOMOTIVES

Request has been received from a member road covering revision or clarification of Page F-103 of the Manual of Standard and Recommended Practices so as to make it more descriptive. In accordance with the recommended practice adopted in 1932, any locomotive, whether switch, passenger or freight, irrespective of capacity, if it has two four-wheel swivel trucks with two motors per truck, is classified the same, namely "B-B." This subject will be continued on the docket and either a more descriptive nomenclature be proposed or the present nomenclature suitably illustrated with diagrams to make it more understandable and more uniformly applied when used.

Attention is directed to pages F-234 and F-234-A which to date have not been revised in accordance with other sections of the Manual of Standard and Recommended Practices. It is recommended that the secretary make the following editorial changes on page F-234 in order to bring this sheet in conformance with the balance of the manual:

"Brake Shoes: No change.

"Rolled Steel Wheels: For the 44-ton Diesel-electric switching locomotives, A.A.R. Specification M-107-46, 33-in. rolled-steel wheels No. 33G, as shown on Page G-43 of the A.A.R. Manual of Standard and Recommended Practices.

"For the 600- to 1,000-hp. Diesel-electric switching locomotives, A.A.R. Specification M-107-46, 40-in. rolled steel wheels No. 40A as shown on Page G-67-1946 of the Manual."

The Gas-Turbine Locomotive

The complete program for a coal-burning gas turbine, as presented by Mr. John I. Yellott in June, 1947, at the A.A.R. Mechanical Division Meeting in Atlantic City, is still substantially correct. The preliminary engineering is being done on two locomotives, both being two-cab types.

The American Locomotive Company design of locomotive will utilize the Allis-Chalmers power plant, and the Baldwin Locomotive Works design will utilize the Elliott power plant. The Elliott gas-turbine power plant is conservatively rated at 3,750 shaft horsepower, while the Allis-Chalmers unit has a nominal rating of 4,200. The time when these locomotives will be available on rails is subject to further revision.

SANTA FE OIL-FIRED GAS TURBINE

The Baldwin Locomotive Works is constructing one oil-fired gas-turbine passenger locomotive for the Atchison, Topeka & Santa Fe. This is a single-cab, 4-8-8-4 wheel arrangement locomotive, 91 ft. 6 in. long, coupler to coupler, d.c. electric drive, is rated at 3,750 shaft horsepower, and is designed for 100 m.p.h. The gas-turbine power plant, generators and motors will be supplied by the Elliott Company.

The turbine power plant consists of a two-stage centrifugal compressor, a four-stage reaction turbine, a single combustion chamber, a regenerator, and interconnecting duct work. The turbine and compressor are built in a single rotor, supported by two bearings.

A railway-type double-armature d.c. generator is driven by the turbine through a reduction gear. Starting is accomplished by motorizing one armature of the main generator with a 32-cell, 525-amp.-hour storage battery. Eight traction motors and an a.c. generator for auxiliaries are provided. A dynamic braking exciter is overhung from the main generator frame.

The turbine rotor and blades are designed for 100,000 hr. operation at 85 per cent load, with a gas inlet temperature of 1,275 deg. F. An inlet air cooling system (humidification system) is incorporated for the purpose of maintaining 3,000 rail horsepower up to an altitude of 5,000 ft. and a temperature of 100 deg. F.

The estimated cycle efficiency, using Bunker C fuel oil at

full speed rating, is 22 per cent. This locomotive is scheduled on the rails during the year 1949.

WESTINGHOUSE OIL-FIRED GAS TURBINE

The Westinghouse Electric Corporation has designed an open-cycle, oil-fired gas turbine and this unit in March, 1948, had been tested at the South Philadelphia plant for more than 1,000 hr. The turbine power plant is a compact arrangement, developing 2,000 shaft horsepower.

The power plant consists of a 20-stage axial compressor, 12 combustion tubes equally spaced in a circle arrangement, and an eight-stage turbine. For locomotive application, two 2,000-hp. units can be mounted side by side in a single cab, or the cab can be arranged to accommodate a total of four units. These power units are directly connected to a double-armature d.c. generator through a reduction gear. Starting is accomplished by motorizing one armature of the generator and bringing the unit up to idling speed with storage batteries. The overall thermal efficiency ranges between 16 per cent and 17 per cent at full-speed rating using No. 3 fuel oil or Bunker C fuel oil. Two units generally similar to the one under test are now under construction, and will be used to power a 4,000-hp. Westinghouse locomotive, which will be completed in about 18 months.

GENERAL ELECTRIC GAS TURBINE

General Electric has designed an open-cycle, oil-fired gas-turbine power plant, and this unit in March, 1948, had been tested for 375 hr. under varying load conditions at its Schenectady works. The power plant is 19 ft. long, weighs approximately 20,000 lb. and develops 4,800 shaft horsepower when operating at full speed rating.

The turbine power plant consists of a 15-stage axial flow compressor, six combustion tubes equally spaced in a circle arrangement, and a two-stage turbine.

As proposed for locomotive use, the shaft of the compressor and turbine is directly connected to four d.c. generators through gear-reduction units. The turbine is started by a Diesel engine connected to a generator which produces d.c. power for motorizing the d.c. generator and bringing the unit up to idling speed.

The overall efficiency of this turbine, burning Bunker C fuel oil, is approximately 17 per cent at the shaft after allowance is made for losses and power-plant auxiliaries. It is estimated that a gas-turbine locomotive with a power unit similar to the one being tested will be available in one or two years.

The members of the Committee on Locomotive Construction are: H. H. Lanning (chairman), mechanical engineer, A.T.&S.F. Steam and Electric Locomotives Section; E. L. Bachman (vice-chairman), general superintendent motive power, Pennsylvania; J. E. Ennis, engineering assistant, N.Y.C.; Frank Williams, chief mechanical engineer, Can. Nat'l; D. R. Calleri, mechanical engineer, Sou. Pac.; J. L. Ryan, mechanical engineer, St.L.-S.F. Diesel Locomotive Section; A. G. Hoppe (vice-chairman), general superintendent locomotive and car departments, C.M.St.P.&P.; K. Cartwright, chief mechanical engineer, N.Y.N.H.&H.; G. W. Bohannon, assistant chief mechanical officer, C.&N.W.; J. D. Loftis, chief motive power and equipment, A.C.L.; G. F. Wiles, supervisor Diesel-electric locomotive operation, B.&O., Gas Turbine Locomotive Section; H. C. Wyatt (vice-chairman), assistant general superintendent motive power, N. & W.; J. B. Blackburn, engineer motive power, C. & O.; J. L. Carver, mechanical and research engineer, I. C.; E. P. Gangewere, superintendent motive power and rolling equipment, Reading; J. P. Ashby, Jr., assistant engineer Diesel and electric locomotive design, U. P.

Discussion

Members, in discussing this report, said that there are several matters of vital importance to roads operating Diesel power; the question of brake shoes for road locomotives, lubricating oils, fuel oils and Diesel maintenance costs. The question of brake shoes resolved itself into specific recommendations that practices should be so set up that (1) a minimum amount of braking should be done; (2) the maintenance of truck brake rigging should be so controlled that brake shoes apply evenly on all wheels, and (3) the roads adopt a type of

shoe that does not set up heat concentrations. It was suggested that these recommendations might contribute greatly to reductions in thermal cracking and wheel failures.

In the matter of lubricating oils for Diesel engines there seemed to be a leaning toward a demand for a "universal" crank-case oil specification.

With the increased demand and cost of Diesel fuel a member suggested that the roads should recognize the possibility of a trend toward lower cetane rating and an increase in sulphur content. Such a trend might easily have a serious effect on engine performance and an increase in engine maintenance cost.

Another member, taking exception to the committee's recommendation that the study of Diesel costs be discontinued, emphasized the value of a general knowledge of Diesel operating costs in establishing operating policies. The chairman of the Diesel section of the report made the observation that the lack of cooperation of member roads in supplying the type of data that the committee felt desirable resulted only in mass of data of little tangible worth. The situation, being what is, formed the basis of the recommendation to discontinue the study.

The report was accepted and the recommendations submitted to letter ballot.

Research To Improve Crank Pin Design

Progress reports on 20 different types of crank pins show value of studies—Relief grooves and metallized pins

The Committee on Crank-Pin Research, organized in 1938, was given the assignment of investigating the fatigue strength of steam-locomotive main crank pins and developing data on which to improve the design of these parts with the objective of reducing service failures due to the development of progressive failures in the hub fit of the wheel center. Based on a survey of main-crank-pin failures on member roads conducted during the nine-months' period of November 15, 1937, through August 15, 1938, a laboratory research program was undertaken at the Canton Laboratory of the Timken Roller Bearing Company, utilizing the A.A.R. axle fatigue testing machines previously installed and used for testing full sized 5½-in. by 10-in. axles. To utilize this existing laboratory equipment for the crank-pin research program it was necessary to limit the size of the crank pin specimens to the capacity of the axle testing machines. Crank pins having a wheel hub fit of 9½-in. diameter were decided on and the crank-pin program has been carried along when the machines were available since 1942.

During the six-year period from 1942 to 1948, two progress reports have been made and the third is in preparation.

First Progress Report

This report, dated March 11, 1943, outlined investigations on four types of crank pins as follows:

Design 1, (10 pins) was a straight cylindrical pin, and pressed into a wheel center having a straight cylindrical bore.

Design 2, (7 pins) was a pin identical to Design 1, except that the outer end of crank pin wheel seat was tapered .008 in. on the diameter for a distance inside the wheel fit of 1¼ in.

Design 3, (7 pins) was identical to Design 1, except that the wheel seat of the crank pin was cold rolled.

Design 4, (2 pins) was identical to Design 1, except that the wheel seat of the crank pin was flame-hardened.

The material of all pins reported in the first progress report was purchased to A.A.R. Spec. M-102-40, Grade 3, but the material was later found to conform to Specification M-104-37, Class A, normalized and tempered forgings.

Results indicated in the first progress report were to the effect that the endurance limit (on the basis of 300,000 mi. simulated operation) on the Design 1 pin was 10,500 lb. per sq. in. in the wheel fit. Incipient cracks were observed in all tests of this type with stresses as low as 7,000 lb. per sq. in. There was not sufficient test data to evaluate the other designs.

Second Progress Report

This report covers additional tests of the four crank-pin designs mentioned above. From the combined data available in this report a percentage rating, based on its fatigue strength in the wheel fit, was assigned to each type as follows:

	Per Cent
Type 1—Cylindrical, machined	100
Type 2—Tapered seat	136

Type 3—Rolled	more than 200
Type 4—Flame hardened.....	146 to 164

Considerable evidence indicated that fatigue cracks were initiated in the Type 1 pin at extremely low stresses and that the crack depth has a straight-line relation with the stress when plotted logarithmically. The endurance limit of this design was established as 11,000 lb. per sq. in.

Crack propagation characteristics in the Type 2 pin were very similar to those of the Type 1 pin. The endurance limit, however, was found to be 15,000 lb. per sq. in.

Type 3 pins did not break up to 22,000 lb. per sq. in., the highest stress at which they were tested. Cracks were initiated at the lowest test stress of 9,000 lb. per sq. in. It was evident that rolling the wheel seat surface materially retards the propagation, if not the initiation, of fatigue cracks.

Some difficulty was experienced with thermal cracks which appeared during the flame hardening of the Type 4 crank pin. In general, the deeper the case the higher the fatigue strength of the crank pin. Grinding after flame hardening appeared to have a beneficial effect.

The allowable fatigue strength after flame hardening and grinding appeared to lie between 16,000 and 18,000 lb. per sq. in. depending on the exact treatment.

Third Progress Report

This report, which is now in preparation, is expected to be available about August 1, 1948, and covers the results of investigations of 16 additional types of crank pins the characteristics of which are as follows:

Type 5—Quenched on O.D. & I.D., tempered at 1000 deg. F.
Type 6—Quenched, O.D. only, tempered at 1000 deg. F.
Type 7—Quenched, O.D. only, tempered at 750 deg. F.
Type 8—Quenched, O.D. & I.D., tempered at 500 deg. F.
Type 9—Quenched, O.D. only, tempered at 500 deg. F.
Type 10—Quenched, O.D. & I.D., tempered at 750 deg. F.
Type 11—One-inch relief groove half in, half outside wheel fit.

Type 12—Ground wheel fit, tapered 0.003 in. on diameter.
Type 13—Two-stage fit, inside half of wheel fit ¼ in. larger than outside half.

Type 14—Raised wheel seat, main parallel diameter ½ in. smaller than wheel seat.

Type 15—Wheel seat shot peened.

Type 16—Wheel seat metallized with 1.20C wire.

Type 17—Wheel seat shot peened and metallized with 1.20C wire.

Type 18—(Combination of Types 3 and 11). Rolled wheel seat and relief groove.

Type 19—(Combination of Types 3 and 10). Rolled wheel seat, quenched at 1,550 deg. F., tempered at 750 deg. F.

Type 20—(Combination of Types 3, 10, and 11). Rolled wheel seat, relief groove, quenched at 1,550 deg. F., tempered at 750 deg. F.

The last three crank-pin types mentioned above were added in an effort to combine desirable characteristics of some previous designs. The results of the investigation which were outlined in the third progress report are as follows:

Limited test data indicated that there was no noticeable difference between O.D. and I.D. quenched compared to O.D. only quenched pins. Tempering at 500 degrees or 750 degrees gives far higher endurance limits than at 1,000 deg. F. The pins tempered at the lower temperatures showed fatigue resistance comparable to that shown by the rolled pin (Type 3). The 750 degree F. tempering is preferred because of the greater machinability of the resulting pin.

Types 11 (relief groove) and 14 (raised wheel seat) showed 45 per cent improvement in fatigue strength over Type 1. Types 12 (tapered) and 13 (two-stage fit) had a fatigue strength only 14 per cent or less higher than Type 1. Crank pin Type 15, not machined after peening, showed a 55 per cent increase in endurance limit over Type 1. Type 16, which was merely metallized, gave no evidence of improvement, whereas Type 17, which was shot peened and metallized had an endurance limit 64 per cent above that of the Type 1.

None of the Type 18 (rolled and relief groove) pins broke in any tests up to the maximum stress of 22,000 lb. per sq. in. All pins, however, showed deeper fatigue cracks than corresponding Type 3 pins. Evidently some of the beneficial residual stresses caught by rolling are relieved by the groove.

The test runs of Type 19 (rolled and heat treated) pins indicate that no increased benefit can be reaped from rolling the Type 10 pin. The crack depth was approximately the same as that of the unrolled pin.

Four tests on the Type 20 (rolled, relief groove, and heat treated) pin indicate that this design may have a higher resistance to fatigue cracking than any other pin investigated. This conclusion is based on the depth of fatigue cracks after completion of 300,000 equivalent miles at certain stresses compared to the values recorded for other types of pins under the same conditions.

No tests were run at stress levels over 22,000 lb. per sq. in. because it was found impossible to keep the pin from pulling out of the wheel bore at those loads.

Road Service Experience

Information received from some member roads covering experience with main crank pins modified to take advantage of experimental data available as a result of a laboratory research program covers crank pins with relief grooves. For example, the Missouri Pacific reported as of January 17, 1948, on the expensive use of crank pins having machined and polished relief grooves.

Experimentation with the relief groove (Laboratory Type 11) on this railroad was started in 1941 and the practice was adopted as standard in September, 1945. A typical application to a main pin for heavy power is shown in Fig. 1, and the position of the groove with respect to hub fit is indicated in Fig. 2. It is the practice on this railroad to prestress the bore in the crank-pin hub before application of the crank pin by pressing through a plug as shown in Fig. 3.

Before the use of this type of pin and practice in applica-

tion, cracks developed at a point just inside the wheel fit and the service life of main crank pins was limited to 150,000 miles. Since the use of the relief groove pin and prestressed

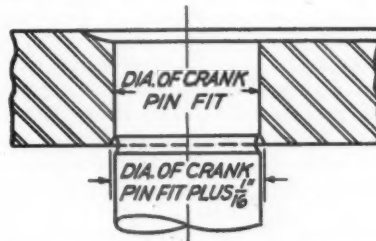
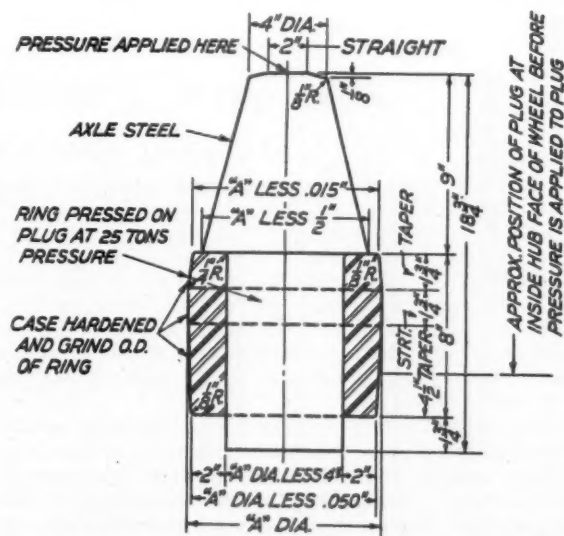


Fig. 2—Diagram of pin showing location of relief groove

hub bore the mileage limit was first increased to 300,000 miles. Later (when no cracks were found in most pins after the longer service period) the mileage limit was discontinued altogether and pins are now renewed on the basis of wear to



Dimension "A" = wheel bore plus .025 in. min. to .040 in. max. Initial wheel bore to be 1/32 in. under dia. as specified on wheel drawing.

Example:—Drawing calls for 10 in. bore, initial bore equals 9 31/32 in. Make plug 9 31/32 in. plus 0.25 in. minimum to plus .040 in. maximum, which will give finish bore 9.96875 in. + .025 in. = 9.99375 in. or 9.96875 in. + .040 in. = 10.00875 in. or approx. 10 in. as specified.

Fig. 3—Bore pre-stressing plug

a diameter 5/16 in. less than that shown on the drawing. One pin is recorded to have traveled 563,000 miles before it was removed on account of wear.

Pennsylvania Metallized Crank Pins

A report furnished under date of January 14, 1948, by the Pennsylvania covering its service experience with metallized wheel-seat crank pins, states that experimental service installations were started in 1942 on six IIs freight locomotives (12 pins). Ten pins were later applied experimentally to K4s locomotives in high-speed passenger service.

The crank pins were prepared by machining the wheel seat to 1/16 in. less than the diameter of the wheel bore. The surface was then knurled and shot blasted before building up with 1.2 per cent carbon spraymetal wire until the pressed fit diameter was 1/16 in. larger than the wheel bore. The wheel fit area was then ground to the size required to obtain a 165- to 198-ton mounting pressure. Seven of the twelve pins on the IIs freight locomotives have been removed. None was cracked in the wheel fit. Five pins were still in service at the time of reporting and two had completed over 145,000 mi.

All ten pins were removed from the class K4s passenger locomotives after the prescribed limit of about 125,000 miles. Five of the ten were cracked in the fillet, but none in the metallized wheel seat.

The original report contained photographs of the spray-metal portion of a crank pin removed from a Pennsylvania

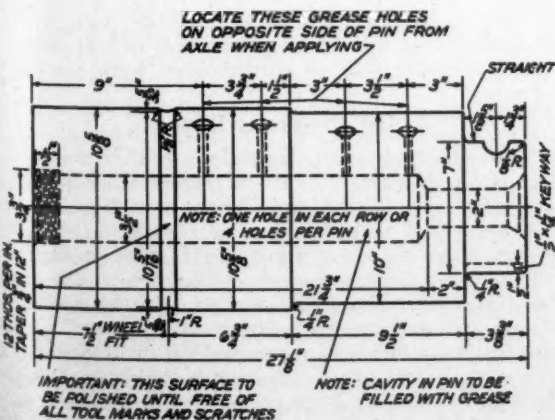


Fig. 1—Crank pin design with relief groove

Class 11s locomotive showing the lack of contact near the fillet on the opposite side of the crank pin from the keyway. The bearing areas of both pin and wheel were practically smooth on all metallized pin applications after removal. Other photographs showed the condition of the crank pin after removal.—EDITOR

The railroad's conclusions, based on its experience with the preparation and application of the experimental groups of metallized main crank pins in freight and passenger service, as of January 14, 1948, was stated as:

1—All main crank pins with the metallized sleeve were found to be tight in the wheel center at the time of removal, requiring from 200 to 360 tons pressure to start the pins out.

2—All but two of the seventeen pins removed came out without damaging the metallized sleeve. A small piece of the metallized sleeve broke out at the keyway on two of the Class 11s pins.

3—There were no cracks found in the pressed fit portion of either the 11s or the K4s main crank pins when removed from the wheel centers.

4—The metallized sleeve provides protection against galling

the pressed fit surface of the main crank pin, or the wheel center.

5—As the wheel-center pin holes are not scored in applying or removing the pin, less material will have to be machined out in truing up the pin hole for another pin application, thus increasing the life of the wheel center, and reducing shop costs of crank-pin renewals.

No comparative tests were made with unprocessed pins of the same base material in parallel service, the application being made to note the condition of the pressed-fit surfaces and the reliability of the pins thus processed with the metallized sleeve staying tight in actual road service over a period of time.

The members of the Committee on Crank-Pin Research are J. R. Jackson (chairman), mechanical engineer, Mechanical Division, A.A.R.; K. Cartwright, chief mechanical engineer, N.Y. N.H. & H.; J. B. Blackburn, engineer motive power, C. & O.; E. L. Bachman, general superintendent motive power, Penn.; G. W. Bohannon, assistant-chief mechanical officer, C. & N.W.

The report was accepted.

Research to Improve Car Axle Design

A ten-year research program summarized in progress reports—Relief grooves show value

The Committee on Axle Research, organized in 1937, was given the assignment of determining the fatigue strength of the then A.A.R. standard (1928) all-purpose black-collar axle design and developing data on which to base the design of a car axle having a higher factor of safety against fatigue failures in the wheel set fit.

In December, 1937, a higher number of fatigue tests, mostly on full size 5½-in. by 10-in. axles, have been run on the testing machines at the plant of the Timken Roller Bearing Company, Canton, Ohio. During the ten-year period, 1938-1948, six progress and two special reports have been issued and the seventh progress report is in preparation.

The axle research program at the Canton laboratory is being continued on a group of heat-treated axles of the 1940 passenger-car design for comparison with the as-forged and a limited number of normalized and tempered axles previously tested.

The tangible results of the research program were the adoption of a new passenger-car axle in 1940 (Research Design No. 6), and the Urschel-Pittsburgh tubular axles as an alternate standard in 1941. The 1928 standard black-collar axle, smooth forged between wheel seats, is still the standard freight axle.

First Progress Report

The first progress report, dated May 1, 1938, dealt with three types of axles as follows:

Design 1—The 1928 standard A.A.R. 5½-in. by 10-in. car axle, having a 7-in. wheel seat diameter.

Design 2—Axles varying from the 1928 standard by an increase in the wheel seat diameter to 7½-in. and removal of the black collar.

Design 3—Axles varying from the 1928 standard by an increase in the wheel seat diameter to 8½-in. and removal of the black collar.

All axles in these and subsequent tests were run with wrought-steel wheel discs unless otherwise stated.

The results of these tests indicated that the allowable wheel-seat fatigue stress (on the basis of 84,300,000 stress reversals, or 150,000 equivalent miles) for the 1928 standard (Design 1) axle was 11,000 lb. per sq. in.

Insufficient data were available to find values for the stress at which a Design 1 axle would not develop fatigue cracks, or for any quantitative evaluation of axles of Designs 2 or 3.

Second Progress Report

The second progress report, dated November 1, 1938,

covered further tests on axles of the same three designs. The results of these tests were:

The 11,000 lb. per sq. in. endurance limit for the Design 1 axle was confirmed and 9,000 lb. per sq. in. was fixed as a preliminary figure for the stress below which no cracks develop in the wheel seat in at least 150,000 equivalent miles. The body portion of the axle has a capacity about 40 per cent greater than the wheel seat, assuming Reuleaux loading.

For the Design 2 axle (7½-in. wheel seat, no black collar) the endurance limit was found to be 14,000 lb. per sq. in. an improvement of 27 per cent over the 1928 standard (Design 1) axle. Because of the increased section modulus, this axle design can carry a load 64 per cent greater than the 1928 standard axle without breaking in the wheel seat. Sufficient tests were not run to determine the stress at which fatigue cracks will not be initiated in the wheel seat, but a value of at least 12,000 lb. per sq. in. was indicated. Assuming this improvement, an increased axle capacity before development of fatigue cracks of 72 per cent was indicated possible by the use of the Design 2 axle compared to Design 1. This increase could be fully realized without danger of breaking the body portion of the axle.

The Design 3 axle (8½-in. wheel seat, no black collar) did not break off in the wheel fit unless stressed beyond 16,000 lb. per sq. in. The capacity of the axle based on fatigue strength in that portion was indicated to be 127 per cent above the Design 1, and 38 per cent above the Design 2 axle. These values are not significant because the body portion of the axle is weaker than the wheel seat section in this design. It was for that reason that no further tests were run on this type of axle.

Third Progress Report

The third progress report, dated June 1, 1939, covers tests on axles of Designs 1 and 2, which are described above, and on two new Designs 4 and 5. There was some question whether the wheel seat diameter of 7½-in. for Design 2 would permit the use of existing wheels without danger of reducing the hub thickness of the wheel below safe values. For this reason axle Design No. 4 with a 7 9/16-in. diameter wheel seat and without black collar was tested. The body diameter of this axle was increased ¼-in. adjoining the wheel seat and 1/16-in. at the center over the Design 1 axle. Design 5 is one sometimes used in service for increased load capacity. Its body and wheel-seat diameters are those of a 1928 standard A.A.R. 6-in. by 11-in. axle with the black

collar; the dimensions of its journal are 5½-in. by 10-in.

The results of these tests were:

The 11,000 lb. per sq. in. endurance limit and 9,000 lb. per sq. in. initial crack limit were confirmed for the Design 1 axle. Similar values of 14,000 lb. per sq. in. and 13,500 lb. per sq. in. respectively were established for the Design 2 axle. Several tests were made with axles having a 2½-in. radius fillet adjoining the inside hub face of the wheel seat. The larger fillets eliminated cracks which occurred with the 1½-in. radius fillets.

The endurance limit of the Design 4 axle was indicated as 14,000 lb. per sq. in. and the initial crack limit, 12,000 lb. per sq. in. The values for the Design 3 axle had not been definitely determined, but it did not appear that they would be very favorable.

Of the 68 axles tested up to that time, 11 developed failures in the body. None of these axles was of Design 1. The Designs 2, 4 and 5 axles broken in the body were cracked in the wheel seat at the time of the failure. It appears that the minimum endurance limit of the axle body is approximately 17,500 lb. per sq. in.

The tests up to this point indicated that the raised wheel seat and the elimination of the black collar would increase the initial crack limit of the axle by as much as 50 per cent.

Fourth Progress Report

The fourth progress report, dated April 1, 1940, covered the added design (Design 6) representing a combination of Designs 2 and 4 which was added to accommodate wheel-mounting tolerance conditions, to minimize the scrapping of existing wheels due to having too thin a hub section, and to maintain the same axle body diameter at the center and approximate taper as exists on 1928 standard axles. For the purposes of this test the data of Designs 4 and 6 may be used as pertaining to one design, because the wheel seat portions are identical.

A limited number of axles from normalized and tempered material were tested. All others were machined from as-forged axle stock.

The results of these tests were:

Axle Design 6 was rated as the best of the designs tested and was recommended for adoption as the new A.A.R. standard for passenger car axles. It gives an allowable design fatigue stress in the wheel seat 60 to 80 per cent greater than the 1928 standard design. (Part III covers redesign methods and calculations).

Insufficient data had been gathered to formulate a decision about the advantage offered by normalizing and tempering of axle stock.

Fifth Progress Report

The fifth progress report, dated May 27, 1941, covered another group of tests of Design 6 (new 1940 standard) to study the effect of normalizing and tempering to A.A.R. Specification M-104, and of variations in carbon content within the range of material specification No. M-101. The effects of reducing wheel hub thickness to ¾-in. adding a relief groove at the position of the black collar on the 1928 Standard axle, and flame hardening, or metal spraying the axle wheel seat were studied. The report also submits some fatigue data on tubular types of axles.

Tests on one-quarter-size scale models were run to study methods of clamping the generator pulley to the body of the axle in a way to prevent excessive stress concentrations.

The results of these tests were:

It was found that the as-forged axles with carbon content near the minimum range in Specification M-101 (0.39 to 0.43 per cent) had a higher endurance limit than either the higher carbon as-forged or the normalized and tempered axles. The as-forged axles tested also had a larger spread between the endurance limit and initial cracking limit than the Specification M-104 axles. The higher carbon content material provided the highest initial crack limit.

The tests with ¾-in. wheel hubs indicate that no hub failures are caused by the decrease in hub thickness, and that no appreciable effect on the axle fatigue stress can be noted. The relief groove at the black collar location on Design 1 axles tends to show some increase in the endurance limit of the 1928 Standard axles. The tests are being continued to obtain quantitative results.

Two Design 1 axles were metal sprayed and two flame hardened in the wheel-seat portion to find whether these processes may help to prolong the life of this type axle. Results were sufficiently encouraging to continue this phase of the investigation.

The Urschel-Pittsburgh type tubular axle tested was found to have an incipient crack limit of 13,500 lb. per sq. in. which is a 12 per cent improvement over the new standard (Design 6) axle. The rate of crack propagation in the Urschel axle was less than in the Design 6 axle. Carnegie-Illinois hollow axles gave comparatively poor results, while Timken hollow-axle tests with a number of widely different heat treatments showed no definite trend. Results of tests, also not very conclusive, on Dominion Foundaries and General Steel Castings hollow axles are shown in the tabulation. This is as a matter of record.

Tests on one-quarter-size scale model axles revealed that ½-in. thick steel split bushings between the pulley and the axle as as detrimental to axle fatigue strength as the press fit of a wheel. The use of a rubber bushing, or corrugated steel sleeve between the pulley and axle was found to give much higher axle fatigue strength than that obtained with the steel split bushing.

Sixth Progress Report

The sixth progress report, dated September 17, 1942, gives the results of tests using wheels with ¾-in. hubs the effect of clamping generator pulleys on axles, and the use of rolled wheel fits. Axle Designs 7 and 8 were introduced and tested. Design 7 has a relief groove machined in place of the black collar on the Design 1 axle. Design 8 has the black collar machined down to wheel seat diameter size. Both types are designed to increase the life of 1928 Standard axles now in use.

The results of these tests were:

Tests data indicate that reduction of the minimum hub thickness on 5½-in. 10-in. wheels to ¾-in. results in neither slipping of the wheel on its seat nor early fatigue failures in the hub.

The clamping action of a generator pulley on passenger car axles tends greatly to decrease the axle fatigue strength of the body portion of the axle between the wheel fits. Of the three designs tested the Pullman rubber bushing had the least detrimental effect. Corrugated steel bushings decrease the allowable stress in inverse relation to their length. Water spray on the clamped area decreases the permissible stresses considerably beyond mere clamping.

Fatigue tests on second-hand axles (both 1928 and prior standard) and their modifications (black collar machined off) revealed that compared to new 1928 axles they have 22 per cent less resistance to initiation of fatigue cracks, but the same endurance limit. The Design 7 axle with a relief groove increase the endurance limit from 11,000 lbs. per sq. in. to 12,500 lbs. per sq. in. Design 8 (no black collar) indicated no improvement over Design 1.

Tests on new axles showed an increase in endurance limit of 27 per cent for axle Design 7A (relief groove ½-in. from inside hub face) and 63 per cent for Design 7B (relief groove flush with wheel hub) over Design 1 (1928 Standard). The improvement in initial cracking limit may be about half that amount.

Cold rolling wheel fits increases the endurance limit of the Design 6 axle. The rate of fatigue crack propagation is considerably retarded by cold rolling. Exact quantitative results are not available.

Seventh Progress Report

The seventh progress report, now in preparation, covers the complete investigation of axles conforming to A.A.R. Material Specification M-101 (non-treated alloy steel). Ten Design 1 (1928 Standard) and nine Design 6 (1940 Standard) passenger-car axles were tested to compare their fatigue strength in cast-iron vs. wrought-steel wheel disks, and six additional Design 6 axles were tested for body fatigue stress.

The results of these tests were:

It was found that in cast-iron wheel disks there is little difference in the endurance limit of designs 1 and 6 axles, whereas the Design 6 axle is superior to the Design 1 in wrought-steel disks. For both designs the cast-iron wheel

was less detrimental in terms of initial cracking limit and fatigue crack depth than the wrought-steel wheel.

	Endurance limit, 16 per sq. in.		Initial cracking limit, 16 per sq. in.	
	Cast Iron Disk	Wrought Steel Disk	Cast Iron Disk	Wrought Steel Disk
Design 1.....	15,000	11,000	12,000	9,000
Design 6.....	16,000	16,000	12,000	9,000

Of the six Design 6 axle bodies tested at this time, none broke at a stress less than 20,500 lb. per sq. in. in the body. Experience with over 100 axle bodies indicates, however, that the minimum fatigue stress in the unrolled body portion is 17,500 lb. per sq. in., although some axles did not break at stresses as high as 25,000 lb. per sq. in. in 150,000 equivalent miles operation.

Axles with Generator Pulleys

The report called the attention to special reports covering supplementary investigations at the Canton laboratory on tests of 5½-in. by 10-in. axles with generator pulleys. A special test was run for the Pennsylvania to study further the effect of clamping pulleys on passenger car axles.

The results of these tests were:

The allowable stresses in the axle body to prevent breaking off were found to be 19,500 lb. per sq. in. for A, 18,500 lb. per sq. in. for B, less than 17,900 lb. per sq. in. for C, and over 23,000 lb. per sq. in. for D. The results supplement the A.A.R. tests described in the Sixth Progress Report.

Tests of Tender Axles

In 1942 the committee was informed of the prevalent service condition of fatigue cracks developing in the wheel seats of 6½-12-in. 1928 Standard A.A.R. axles under six-wheel locomotive tenders on the Norfolk & Western, and suggested that the initiation and development of these fatigue cracks into axle failures might be prevented by machining relief grooves at the black collar locations. Acting on the committee's suggestion, the railroad undertook a road-test program, starting late in 1942 and early 1943. Four complete tender sets (24 axles) were selected from axles removed from service on account of fatigue cracks having developed in the wheel seat between the black collar and inside of wheel hub face. The cracks were removed by machining off the black collars

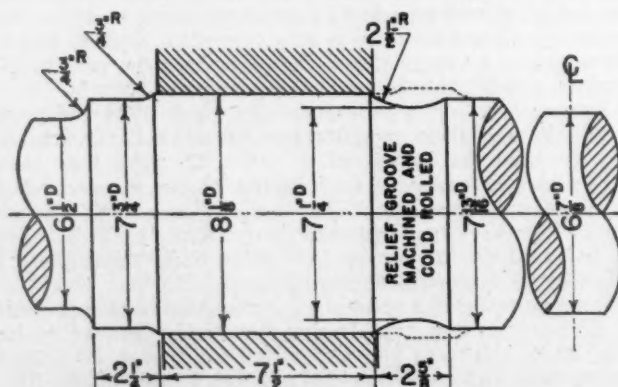


Fig. 1—Location of relief groove in N. & W. tender axle

and providing relief grooves. The modified 6½-12-in. axles were proportioned to the experimental Design 7, 5½-10-in. axles included in the laboratory test program.

The four tender sets (24 axles) applied for service tests had the following wheel-seat finishing variations, in addition to the machined and cold-rolled relief grooves:

Solid Bearing Axles: Six axles with wheel seats machined only; six axles with wheel seats cold rolled after machining and six with wheel seats flame hardened after machining.

Roller Bearing Axles: Six axles with wheel seats ground only.

The results of these tests were:

As of September 30, 1947, the railroad reported 18 out of the original 24 reconditioned axles still running and that they had made from 237,707 to 331,880 service miles per axle. Four of the solid-bearing axles had been scrapped on account of hot journals, and one additional solid-bearing axle was lost. One roller-bearing axle had been scrapped on ac-

count of rotation of the inner bearing race on the axle and fine circumferential cracks in the wheel seat, approximately one inch from the outer edge.

No conclusive information had developed relative to the various wheel-seat finishing operations included in these 24 reconditioned axles.

The Norfolk & Western was so favorably impressed with the results of these original tests of the 24 reconditioned 6½-in. by 12-in. axles with machined and cold rolled relief grooves that a total of 188 additional new roller-bearing tender axles, conforming to Fig. 1, had been placed in service as of October 21, 1947. After five years of service experience they have concluded that the relief groove has proved beneficial in preventing the development of fatigue cracks at the inner end of the wheel seat.

Letter Ballot Items

The following actions approved by this committee and concurred in by the Committee on Car Construction, were recommended for action as 1948 letter ballot items.

1—Axles under cars in BX service. All new cars built after January 1, 1949, or cars converted for BX service after January 1, 1949, shall be equipped with A.A.R. 1940 standard passenger-car axles (page D-3-1947, Manual).

2—Adoption of the A.A.R. 1940 standard passenger-car axle as A.A.R. standard all-purpose axle. Present standard for new passenger-car axles, adopted in 1940 (page D-3-1947, Manual), to be made standard for all purposes and to replace the present standard black-collar axle for freight cars, adopted in 1928 (page D-6-1947, Manual): effective date to be established.

The members of the Committee on Axle Research are J. R. Jackson (chairman), mechanical engineer, Mechanical Division, A.A.R.; T. P. Irving, engineer of car construction, C. & O.; T. D. Sedwick, engineer of tests, C. R. I. & P.; J. A. Gower, assistant mechanical engineer, Pennsylvania; K. Cartwright, chief mechanical engineer, N.Y., N.H. & H.; J. B. Blackburn, engineer of motive power, C. & O.; H. H. Haupt, general superintendent motive power, Pennsylvania; A. M. Johnsen, engineer of tests, Pullman Company; G. W. Bohannon, assistant chief mechanical officer, C. & N.W. and E. L. Johnson, assistant chief engineer motive power and rolling stock, N.Y.C.

Discussion

The attitude of several people toward the value of the information submitted in the axle research report is typified by that of the following abstract of a written discussion submitted. "I doubt whether axles of the former M.C.B. and A.A.R. designs when used under tenders were ever sufficiently free from fractures to be regarded as entirely satisfactory. Trouble of this nature seems to have increased with every step in the progressive increases in tender capacity, weights and speed. When viewed in the light of experience, the 5½-in. by 10-in. axle, the subject of this research, was a particularly bad offender. The design of this axle was checked according to every available formula or standard and found to be correct. However, the axles continued to fail as they had done over a long period of time. The report of the committee sheds much light upon the reasons for these continued failures, but the basic part of the information comes to us about 30 years too late."

Continuing, he said, on our road, "The problem of the 5½-in. by 10-in. axle tender was solved by a long series of studies, including the nature, location and extent of fractures, locomotive mileage, etc. As a result of these studies, wheel fits were progressively and arbitrarily increased in diameter until failures in this location ceased. As wheel fit failures abated, the frequency of failures in the body portions of the axle increased, and one failure of this kind resulted in a disastrous accident to an important passenger train. The middle portion of the axle was then reinforced substantially and promptly. At the conclusion of this program the diameter of wheel fit stood at 7½ in. and the middle portion of the axle was cylindrical 7 in. in diameter with fillets of 16 in. radius joining the cylindrical portion to each of the wheel fits. This design remains unchanged as of this date, and I can count on my fingers all of the fractures that have been reported, as regards friction bearing axles, in 30 years."

"The studies and developments which resulted in the above-mentioned reinforcements required a period of approximately five years for completion. Had the data which have been disclosed in this report been available, at that time, the design could have been corrected over night, some unnecessary weight could have been saved in the design of the axle, and several very expensive accidents might have been avoided. The real purpose of the foregoing narrative is to emphasize the value of research and not to brag about what was accomplished, although we are not ashamed of it.

"The committee, in addition to reinforcing the points of basic weakness in the 5½-in. by 10-in. axle design, has developed other information of value through its research work. One of the most important of these developments has been the elimination of the black collar, a long overlooked stress raiser located at a vital spot in the axle. I had to think about this for a long time before visions of derailments due to wheels becoming loose and shifting on axles, disappeared from my mind, but both the black collars and the visions are now gone and I am glad of it.

"Another very interesting development in this research has been the strengthening effect of surface hardening of wheel fits either by work hardening or heat treatment. I believe exterior surface hardening is the secret of the success of the hollow axle which was recently adopted as an alternate standard.

"I have been surprised at the low stresses which have been set up as endurance limits and initial cracking limits for the

5½-in. by 10-in. axles. I am mystified by the statements which have been made in attempting to distinguish between these limits . . . I am still unable to understand why repeated stresses of sufficient magnitude to initiate fractures would not also propagate them to final completion. The inference is that surface cracks which do not progress are produced by extreme and unusual forces acting upon wheel flanges. I find it difficult to accept such an explanation. In view of my inability to understand this matter, I intend, when using the research data, to regard the stresses which are shown as initial cracking limits, to be the maximum stresses for which axles should be designed.

"New passenger-car-axle designs adopted in 1946, and now proposed for freight cars, are shown and described on Page D-3 of the Manual in terms of diameters and lengths. These axles are also being considered for locomotive tenders. This system of specifying design details would pass without question if it were not for the fact that we now find axles of the same journal size used with wheels varying in diameters between the limits of 33 in. and 42 in. The increase in bending moment produced by a horizontal force acting upon the flange of a 42-in. wheel would be roughly 12 per cent greater than that produced by an equal force acting upon the flange of a 36-in. wheel, which I believe was the size considered in the research. I feel that this difference in wheel diameters is too large a factor to be overlooked."

(The report was accepted and the recommendations admitted to letter ballot.)

Locomotive and Car Lubrication

Roller bearing lubricants and Diesel oils subject of studies

Since the 1947 report, the committee has held two meetings at Chicago, October 15, 1947, and April 8, 1948. None of the items covered in this report require letter-ballot action.

Roller-Bearing Lubricants

The first progress report, dated April 30, 1946, was approved by the General Committee and distributed to member roads. A brief summary of this report was included in the 1946 annual report of this committee. By reason of the use of the Indianapolis laboratory for other purposes, no work was accomplished on this project during the calendar year 1946.

The second progress report covered work accomplished during the calendar year 1947, under the immediate direction of the mechanical engineer's office of the A.A.R., and under the general supervision of this committee. In addition to the S.K.F. bearing assembly covered by the first report, the report covers tests with different lubricants on bearing assemblies supplied by Timken, Hyatt, and Fafnir, looking toward a more uniform practice by the various railroads, especially those passenger-car runs which cover portions of several railroads between terminals. This report was submitted to the General Committee with the recommendation that copies be made available to member roads as information.

That portion of the recommendations in our 1946 annual report dealing with tests at sub-zero temperatures has not been realized, as the necessary refrigeration equipment was not available in time. A completely refrigerated testing room has been installed at the Indianapolis laboratory and it is expected to obtain low-temperature test data during the current year.

The results obtained with three additional types of roller bearings substantiate the conclusion reached in the first report, and indicate that the general type of oil now used on the railroads for lubrication of the conventional waste-packed journal box will provide a suitable and economical lubricant for roller bearings under passenger cars in interchange service.

It is recommended that the program now under way be continued to a point where specifications for unified lubrica-

tion practice for both passenger and freight equipment in interchange service may be developed and submitted for approval.

Journal-Box Wedge

A joint committee consisting of three members of this committee, and three members of the Car Construction Committee, was appointed to review the dimensions and tolerances of the journal-box wedge and report. Since any study of tolerances necessarily involves the dimensions of the journal box, these will also be considered in the study.

The subject of reclamation of wedges was raised by the Purchases and Stores Division, and considered by the Committee on Car Construction, which, in turn, requested the advice of this committee with respect to location of wear on wedges which might justify reclamation, and suggestions as to procedure. This subject is being canvassed on the railroads represented on this committee.

Diesel Crank-Case Lubrication

The committee finds that Diesel crank-case oils are being produced by a number of oil companies from a variety of base petroleum stocks which differ in their characteristics and behavior. In many cases, additives are used for the purpose of improving the lubrication qualities on the one hand, and mitigating the undesirable properties on the other hand. In the interest of providing reasonable latitude in the purchase and use of lubricating oil, the committee proposes to investigate those properties which influence the compatibility of oils brought together in the same crank case with the idea of establishing standards for desirable properties.

Journal-Box Lids

Since the approval of Specification M-120-47 the committee has been contacted by several manufacturers looking toward submission of lids for approval. The committee desires at this time to acknowledge the cooperation of the manufacturers in producing a suitable journal-box closure.

Up to the time that this report was sent to press, the following makes of lids have been formally submitted, tested, and

approved: Symington-Gould No. B265A for 5 inches by 9 inches and 5½ inches by 10 inches journal boxes; National Malleable Flexo No. 4, 5 inches by 9 inches and 5½ inches by 10 inches journal boxes; Union Spring Manufacturing Co. No. 9278-A for 5 inches by 9 inches and 5½ inches by 10 inches journal boxes and Union Spring & Manufacturing Co. No. 9279-A for 6 inches by 11 inches journal boxes.

The committee again draws attention to the fact that a journal-box lid can be no better than the box to which it is attached. Many journal boxes have been operating with loose fitting and bouncing lids, with the result that the hinge lug and hinge pin hole are badly worn. To apply a new lid to a worn journal-box hinge lug not only defeats the purpose of a suitable journal-box closure, but results in rapid destruction of the lid itself, due to rattling and bouncing. On the other hand, the application of a specification lid to a journal box in good condition produces a tight fit which eliminates bouncing and thereby largely eliminates wear.

Tests of Box Closures

At the suggestion of the mechanical engineer, A.A.R., several railroads have instituted service tests of various combinations of journal-box closures, journal boxes being operated in similar service with various lid closing pressures, with and without dust guards, and also with and without auxiliary devices, such as deflecting strips and hooded extensions. While these tests are still in progress, the data so far available supports the general impression that a tight-fitting lid, with adequate spring pressure, is the best practical closure for the front end of the journal box.

Proposed Lubrication Manual

The committee has undertaken the preparation of a manual which will bear the same relation to lubrication practice as the Wheel and Axle Manual, for example, bears to wheel and axle practice. Suggestions from the membership, and also from the various car foremen's associations will be appreciated by the sub-committee in charge of this work.

The members of the Committee on Lubrication of Cars and Locomotives are L. B. Jones (chairman), engineer of tests, Pennsylvania; J. W. Hergenhan (vice-chairman), assistant engineer, test department, N.Y.C.; E. C. Ellis, superintendent car department, C. & O.; A. J. Picheto, general air brake engineer, I.C.; R. E. Coughlan, chief metallurgist and engineer of tests, C. & N.W.; W. G. Alten, mechanical inspector in charge of lubricating matters, C. B. & Q.; D. C. Davis, lubricating supervisor, A. T. & S. F.; E. H. Jenkins, assistant general superintendent car equipment, Western Region, C.N.R.

Discussion

A member, in commenting on the conclusion in the report to the effect that "the general type of oil now used for the lubrication of conventional waste-packed journal boxes will provide a suitable and economical lubricant for roller bearings" made the observation that if a lighter oil is to be used for this purpose the closure will of necessity have to be more closely watched to prevent leakage.

Another member made the comment that the conventional bearing and box is definitely obsolete and that concerted action should be taken now to assure the development of a new type of journal bearing.

Speaking on the subject of Diesel crank-case oils several members commented on the confusion that is being caused on many roads due to the practice of using several different types and specification of crank case oil and emphasized the desirability of the railroads and the Mechanical Division taking such joint action as will bring about a study of the problems in connection with the lubrication of the different types of Diesel engines now in motive power service and ultimately arriving at a specification or specifications for crank case oil such as will eliminate the necessity for duplication of facilities and test work that is currently creating a difficult problem. Another speaker, in referring to the same subject, remarked that it was not possible to separate the problems of crank case oils from its relationship to the fuel oil used in Diesel engines. The character and the quality of fuel oil has a definite effect on the performance of the lubricating oil, he said. The same speaker raised several questions as to what

the railroads ultimately desire in the way of lubricating oil; what is the effect of reclamation practices on the performance of crank case oil; is mileage a safe indicator of the time to make oil changes and, if not, what is the reliable indicator. He concluded his remarks with the observation that this entire matter is one that should be approached by joint research between railroads, locomotive builders and, if necessary, by outside agencies that might well contribute experience gained in solving similar problems in other industries.

A member commenting on the hot-box situation called attention to the fact that were the member roads to comply with the recommended practices of the A.A.R., and particularly the requirements of Rule 66, a better average of hot-box performance could be expected. The speaker included in his remarks eight specific points of the recommendations that should be complied with. As a specific example of the experience of one road with which the figure was connected he called attention to the hot box epidemic of last August and September and mentioned that after a thorough study of all their experience the following conclusions as to the predominating causes for the increase in hot boxes were first: (a) waste grabs brought about by shock—speed—track conditions—causing bearings to lift either in train yard switching or while en route. (b) lack of proper attention to boxes in order that waste grabs might be controlled. Second: unsatisfactory condition of journal box packing causing a breakdown in lubrication. Third: dry hot weather.

Part of the study of that road involved a record of the repack date of 8,500 cars received in interchange recording only cars carrying repacked dates nine months and extending to fifteen months and over. The result was as follows:

Last repacked date	No. cars	Percentage
9 months old	456	5.3
10 months old	440	5.1
11 months old	453	5.3
12 months old	422	4.9
13 months old	352	4.1
14 months old	314	3.7
15 months old and over	597	6.9

Adding the 14 and 15 months and over cases the speaker mentioned that it could be seen that 911 cases were over date for brass examination and repack and he commented that this certainly was not a healthy condition and was one that unquestionably contributed to general bearing failure. Continuing, he said, under the best conditions the stipulated maximum repack period is high enough without having a situation where practically 7 per cent of the cars operating are 15 months old or over. This, he said, is evidence of the necessity of impressing car department people with the importance of complying with the requirements of Rule 66.

In conclusion this speaker said that, "The committee's reference to the fact that a journal box lid can be no better than the box to which it is attached is well put. After all, the contents of a journal box are the most vital part of a car and consequently should receive the best protection. More attention to the proper condition of journal boxes will enable the cover to do the job intended and prolong the lubricating qualities of the waste and oil."

(The report was accepted.)

Development of Journal Bearings

Progress report on tests of V-bearing assemblies and recommendations on lot serial numbers

Since the 1947 annual report the committee held one meeting with the solid bearing manufacturers' engineering representatives at the Indianapolis laboratory May 19, 1948. At this joint meeting means for the possible improvement in the design of solid type railway car journal bearings were discussed, along with a program contemplating the utilization of the recently completed research facilities available at the Indianapolis Laboratory.

Tests of V-Bearing Assemblies

During the year the committee has received reports cover-

ing the removal of numbers of the original lot of 2,336 6-in. by 11-in. test bearing assemblies, and inspected lots of removed bearings assembled at the Indianapolis Laboratory.

Numbers of the test assemblies are still in service, but it is anticipated that final report covering service tests will be available in next year's report.

Journal-Bearing Marking

The 1947 annual report included an item, concurred in by the committee on Specifications for Materials, recommending that the question of the restoration of the name of the purchasing railroad or car owner initials, pattern number, and serial number (optional) be submitted to the membership as a letter-ballot item and, if approved, drawing in the D section of the Manual be changed accordingly. By action of the General Committee prior to presentation of the report, this item was deleted from the 1947 annual report.

At the February 19-20, 1948, meeting of the Committee on Specifications for Materials it was recommended that restoration of the prewar lot serial number (optional) be added to the A.A.R. standard journal-bearing design, shown on page D-24 of the Manual. This recommendation was passed on the premise that the lot serial number is of material assistance to the railroad inspectors in identifying rejected

lots of bearings at the bearing manufacturers' plant. This recommendation was concurred in by the Committee on Journal-Bearing Development at its May 19, 1948, meeting.

It is recommended that the question of the restoration of the lot serial number (optional) on the present standard A.A.R. journal bearing should be submitted as a letter-ballot item.

The members of the committee on Journal-Bearing Development are J. R. Jackson (chairman), mechanical engineer, Mechanical Division, A.A.R.; L. B. Jones, engineer of tests, Pennsylvania; J. W. Hergenhan, assistant engineer, test department, N.Y.C.; J. L. Carver, mechanical and research engineer, I.C.; V. C. Barth, chief chemist, C. & N.W.

Discussion

One member mentioned difficulties being experienced with hot boxes due to broken bearings and loose linings and suggested that the committee give consideration to some practicable means of strengthening the bond between the lining and the brass bearing. Reference was also made to tests of cast-iron-back bearings on the D. L. & W. which are said to show interesting possibilities.

(The report was accepted and recommendations submitted to letter ballot.)

Brake Equipment Developments and Changes

Road tests of lightweight hopper cars with the load-compensating brakes scheduled—Tests of D-22 valves indicate cleaning-period extension

All reports on the cleaning of all cars still in service with experimental AB brakes have been received but a complete report has not been compiled.

From reports of tests of D-22 control valves for improved HSC equipment so far received, indications are that the subcommittee will recommend consideration be given to extending the present 15-month air-brake cleaning period to 24 months.

Pipe Clamps

In last year's report all committee members were requested to equip for test purposes a number of cars having AB brake equipment with a new style of threadless-flange pipe fitting known as Wabco seal in which the pipe is held in place with a rubber and metal fixture. Also, if possible, they were asked to equip some cars with welded forged pipe fittings to determine if these fittings would reduce the great number of broken pipes on AB brake equipment.

Twelve railroads have equipped 905 cars with Wabco seal fittings and three railroads have installed welded forged pipe fittings on 1,266 cars. A circular letter will be sent to all members requesting that they report any failures of these fittings to the secretary of the Mechanical Division.

With the concurrence of the Committee on Car Construction, the committee recommends as a letter ballot item that: (a) The use of pipe clamps of the J-bolt type on all pipe, except retainer-valve pipes, be prohibited on new and rebuilt cars, and (b) The use of pipe clamps of the U-bolt type made of round iron on all pipe, except retainer valve pipes, and U-bolt at angle cock, unless such U-bolt pipe clamps have flattened contact surface with the pipe not less than the diameter of the bolt, be prohibited on new and rebuilt cars.

If approved, it is the intention that these restrictions will be incorporated under the heading "Pipe" on page E-12 of the Manual and recommendation advanced to the Arbitration Committee to make them a mandatory provision (after a future specified date) in Interchange Rule 3.

Use of Copper Bushing

The committee has discussed with the manufacturers for some time the possibility of replacing the present non-metallic bushings in the main cylinders of the AB valves because these bushings become grooved, cracked, etc. After consid-

erable tests by the manufacturers of various metals and non-metallic materials, it was found that a non-metallic material known as Durite was the most promising and has been used in over 450,000 AB service and emergency main cylinder bushings. This application was started over a year ago and to date no reports have been received of any difficulty.

A circular letter will be prepared calling attention to the use of this material, and requesting that if any difficulty is experienced the secretary should be notified.

Air-Brake and Signal Hose

A joint sub-committee reviewed instructions in the 1947 report and revised them with recommendations that the Replacement of Brake Pipe Hose (Other Than Armored Type) be inserted in the Code of Rules under Paragraph (j) of Passenger Car Rule 7. This item was included in the 1948 Code of Rules on Page 325.

The committee recommended as a letter-ballot item for adoption as standard practice "Instructions for Mounting New Brake Pipe Hose Other Than Armored Type." The instructions are:

"(1)—New hose before being mounted shall have the inside lining inspected for defects by sighting through the hose into a 150-watt frosted electric-light bulb. In mounting hose, A.A.R. Standard cement (Manual page E-12) shall be used as a lubricant and applied to fittings; also, sparingly, to inner tube. Coupling and nipple should be forced into hose up to the shoulder on these parts. In applying clamps, care should be taken to place them about midway between the raised portion on the fittings and end of hose. After clamps and bolting lugs are placed in position, (Manual page E-17), the bolt should be inserted and nut drawn to a secure and uniform degree of tightness. In so doing, care must be used not to damage the hose.

"(2)—Reclaimed couplings must be gaged and tested on standard testing device (Manual pages 31-32). The guard-arm pin in coupling must be examined and replaced if necessary. The gasket groove must be cleaned so it may be determined that it will be a good fit for gasket. Shank end of coupling must have sharp edges removed and raised portions made smooth without defacing contour of that part of casting. If shank end of coupling is excessively corroded, it must be scrapped.

"(3)—Nipples should be examined, threads cleaned and rethreaded if necessary. Shank end of nipple must have sharp edges removed and raised portions made smooth without defacing contour of that part of casting. If shank end of nipple is excessively corroded, it must be scrapped.

"(4)—Brake-pipe hose assembly including gasket, before being placed in stock for service, must be tested by passing a $\frac{3}{4}$ -in. ball through same and subjected to an air pressure of 140 lb. while either submerged in water or entirely coated with soap suds."

Also, the committee recommends as a letter-ballot item, that page E-32 of the Manual be revised to include the following between paragraphs 2 and 3:

"Reclaimed couplings that pass the go and no-go gage must be tested on testing device (Manual page E-31). The guard-arm pin in coupling must be examined and replaced if necessary. The gasket groove must be cleaned so it may be determined that it will be a good fit for gasket. Shank end of coupling must have sharp edges removed and raised portions made smooth without defacing contour of that part of casting. If shank end of coupling is excessively corroded, it must be scrapped."

Variable-Load Brake

The committee quoted in full a proposed circular letter advising members of the variable-load brake and the cars equipped to date. Part of the proposed letter is as follows: "This is to advise you that the Illinois Central has now placed in interchange service 400 light-weight hoppers coal cars, Series 73600-73999, equipped with the new ABLC freight brake and automatic slack adjuster.

"A.A.R. Instruction Pamphlet No. 5039-4, Supplement No. 1, March 1948, entitled 'Single Car Testing Device, Code of Tests,' issued by the brake manufacturers and containing the AB brake test code now contains a new test code for testing the ABLC brake. Copies of this pamphlet may be obtained from the brake manufacturers.

"The following instructions are to be observed by member roads in servicing ABLC equipments:

"(1) The load-compensating brake must be single-car tested in the same manner as the single-capacity AB brake; also the compensating valve must be cleaned and tested on the AB rack at the same cleaning interval as is now required for the AB control valve. Suitable adaptor test plate is available.

"(2) Member roads operating cars with the ABLC brake may wish to consider stocking parts special to this equipment."

Air-Hose Gage

Because of numerous complaints received in regard to the large number of brake-pipe hose couplings that pass the present no-go gage, which, after being placed in service are found to have excessive leakage due to worn lips and beads, the committee is investigating the necessity of using a more restrictive no-go gage to eliminate such couplings. All committee members were requested to check 1,000 couplings that have passed the present gage, after which these couplings will be gaged with two modified gages which will be .003 in. and .005 in. undersize, to determine what percentage of couplings will be rejected by each modified gage. After these tests are completed the committee hopes to be in a position to make recommendations as to what action should be taken.

Brake-Pipe Leakage

The committee investigated excessive brake-pipe leakage in freight trains, on complaint made by a number of railroads. The investigation showed that gaskets reclaimed during the war emergency and gaskets of synthetic materials caused most pipe-bracket leakage. Synthetic packing cups, such as Buna S, caused brake-cylinder leakage.

A circular letter has been issued to the members requesting that, at the next periodic air-brake cleaning or when any repairs are made, all control-valve and pipe bracket gaskets be carefully examined and those that were reclaimed or with flattened beads and made of Buna S material be scrapped. A circular letter will also recommend that all brake-cylinder packing cups for AB and U type cylinders be scrapped if made of Buna S materials.

Items Under Consideration

In addition to the above, the following items are among those under consideration: Use of other than standard packing cups in the AB and U type of brake cylinders; reduction of weight of air-brake equipment; standardization of air-brake equipment on Diesel locomotives; location of brake pipe, straight-air and signal hose on front end of Diesel and steam locomotives; investigation of load-compensating brake, elimination of oil and moisture from air lines, particularly on Diesel locomotives; condemning gages for the shank of used hose coupling and nipples; excessive wear in AB valve release valve handles due to use of non-standard cotters; braking ratio for new and rebuilt freight cars, and size of air-brake pipe on passenger cars.

The members of the Committee on Brakes and Brake Equipment are J. P. Lantelme (chairman), general foreman, Penna.; H. I. Trambly, (vice-chairman), air brake instructor, C.B.&Q.; R. J. Watters, general air-brake inspector, N.P.; R. E. Anderson, general air-brake inspector, C.&O.; R. N. Booker, general air-brake inspector, S.P.; W. D. Bowser, engineer air-brake and train-control design, U.P.; D. R. Collins, superintendent air brakes, D.&R.G.W.; F. T. McClure, supervisor air brakes, A.T.&S.F.; A. J. Pichetto, general air-brake engineer, I.C.; L. D. Hays, air-brake engineer, N.Y.C.; R. G. Webb, superintendent air brakes, C.M.St.P.&P.; C. C. Maynard, chief inspector air brakes, C.N.; J. Mattise, superintendent air equipment, C.&N.W.

Discussion

In respect to the use of non-metallic bushings one member expressed a preference for brass bushings and said that his railroad is applying brass bushings on equipment not offered in interchange.

Another member requested that consideration be given immediately to the extension of the present 15-month cleaning period to 24 months for D-22 control valves because of the necessity for conserving man-hours and reducing car maintenance at this time. Referring to pipe clamps, he said that good results had been obtained by bolting air-brake pipes directly to the car underframe. He also felt that the Division should proceed slowly before recommending any return to the use of brass bushings in the main cylinders of AB valves. This member indicated that his railroad had experienced no difficulty with the use of reclaimed rubber gaskets. In respect to the items under consideration as listed in the report he believed that the one dealing with oil and moisture in air lines of Diesel locomotives should be investigated at an early date because the presence of oil and moisture is a condition that creates a problem to those railroads operating in territories where the weather produces a high humidity.

A third member felt that the cleaning period for D-22 control valves should be extended to 36 months. He said that the precision methods used in the shops of his railroad produced a finish on valve surfaces that made the longer cleaning period desirable. In discussing pipe failures and pipe clamps this member said that the failures of threaded pipes had occurred ever since the railroads started operating. He told of the installation of butt-welded pipe in over 500 cars, the welds being made at all locations except at the end valves and at the retainer valves. He said that not one of the welded joints had broken or leaked since being placed in service and he recommended that the socket type weld fitting be made an alternate standard. This member also believed that both the J-type and the U-type bolt clamps should be discontinued because they do not do the job of keeping the air brake pipes rigid. He suggested that commercial clamps be employed because these clamps have been found to be satisfactory and, in addition, they are no more expensive than the bolt types.

In commenting on the tests of the load compensating brake a representative of an air brake company said that these tests would be made on the Pennsylvania near Johnstown with Illinois Central cars equipped with this brake because tests should be conducted on level track and on grades. He also mentioned that a better comparison with the AB brake tests made in 1933 could be made because this Pennsylvania territory was the location of those tests. He indicated that the test train will be longer than the 100 cars used in 1933 and believed that it may have as many as 150 cars. The test will be conducted under the supervision of R. G. Webb, superintendent air

brakes, Chicago, Milwaukee, St. Paul & Pacific, who will represent the A.A.R. The tests will probably start about the 15th of July.

In answering the points raised by the discussers, Mr. Lantelme said that he believed that a twenty-four-month cleaning period for D-22 control valve should be recommended because the indications were that some of the equipment would not operate satisfactorily beyond that time limit. He indicated that the data given in the report was not complete and that when the finished report was made he believed the members would understand why a longer cleaning period should not be recommended. In respect to the use of welded pipe fittings he pointed out that to his knowledge there are no restrictions on the type of pipe fittings that can be used and believed that each railroad could select that type which it felt would do the best job.

(The report was accepted and the recommendation submitted to letter ballot.)

Report on Geared Hand Brakes

Up to the present time A.A.R. certificates of approval have been issued for 18 types of geared hand brakes—12 vertical-wheel types and 6 horizontal wheel types. These are listed in Interchange Rule 101. Brakes that incorporate changes which are not covered by the certificate of approval may not carry the symbol "AAR-1942" or be classified as an approved type until such time as the changes are approved by the committee and revised certificate of approval is issued. Prints of several revised brakes have been received and are being checked for addition to the record in the certificate of approval.

Test Racks

Specifications for and reclamation of geared hand brakes were adopted as standard as a result of general repairs and reclamation of geared hand brakes were adopted as standard as a result of Letter Ballot DV-1147. The committee has decided to modify Fig. 1, July 18, 1947, to show four views of the assembly of the rack proper on one sheet and make a new detail sheet, Fig. 2, for the attachments. On the attachment detail sheet each part is designated by letter and number to indicate its use in tests of vertical, horizontal or lever type brakes. Complete sub-assembly drawings have also been prepared showing details of equipment for attachment to the rack for testing horizontal-wheel brakes, vertical wheel brakes and lever type brakes. In addition to the above drawings, photographs showing typical installations of each of the three types of brakes, with parts marked to check with the designations on detail sheets were included as a part of the report.

The committee has recommended that the Committee on Prices for Labor and Materials make studies of a sufficient number of repair operations to justify setting up an average credit allowance for defective geared hand brakes, thus eliminating the necessity for holding defective brakes and requesting disposition from car owner.

The committee has also been cooperating with the Committee on Prices for Labor and Materials regarding interpretation of specifications with respect to the reclamation of non-approved types of geared hand brakes, and also recommends that a provision be included in the Interchange Rules to protect the car owner against the application of non-approved types in place of approved types.

Welding of Geared Brakes

The committee has recommended to the Car Construction Committee that the item with respect to geared hand brakes now in Interchange Rule 23, Section B, which is also proposed for inclusion in the fusion and bronze-welding regulations in the A.A.R. Manual, be modified.

This modification is to reconcile the wording of the interchange rule with the reclamation specifications, in order that standard welding regulations, the standard specifications for reclamation repairs to geared hand brakes, and Interchange Rule 23 will harmonize.

Uniform Hole Spacing

A survey of the mounting-hole spacing on lever type brakes as supplied to the railroads developed that the present spacing of 7 in. horizontal and 11 in. vertical should be adopted as standard. The committee therefore recommends that a paragraph be added to the lever-brake section of the specifications for geared hand brakes to make the standardization. Preliminary investigation indicates that the standardization of bolt-hole spacing for the horizontal type brake is impracticable due to the different combination of dimensions on the several types of horizontal-wheel brakes which have received A.A.R. certificate of approval.

Testing Device

The adaptation of the test rack at Purdue University for testing lever type hand brakes has been completed and approved by the committee and all of the manufacturers of geared hand brakes were notified on November 11, 1947. Selection of brakes for tests will be made in accordance with Appendix A, Instructions Regarding Certificate of Approval of Geared Hand Brakes.

The committee has approved a riveted construction for fastening the hub to a pressed-steel brake wheel. A welded construction for fastening the hub was also submitted but was not approved for the reason that welding is not permitted under I.C.C. Rules on Safety Appliances, and the committee has previously taken the position that welding of the type indicated will not be permitted.

The members of the Committee on Geared Hand Brakes are A. K. Galloway (chairman), general superintendent motive power and equipment, B. & O.; E. P. Moses, engineer rolling stock, N.Y.C.; J. P. Lantelme, general foreman, Pennsylvania; R. G. Webb, superintendent air brakes, C.M. St.P. & P.; J. R. Jackson, mechanical engineer, Mechanical Division, A.A.R.

Discussion

One member said that the differences in operation of the many types of geared hand brakes was responsible for injuries sustained by train crews. He said that many brakemen think they know how a certain hand brake operates but that in using the brake it frequently works differently than they expected and as a consequence they receive either minor injuries such as bruises or strains or major injuries because they lose their footing and fall to the ground. He suggested that the operation of the several kinds of geared hand brakes be standardized to eliminate these accidents.

In reply Mr. Galloway said that the B. & O. has the hand-brake models located at its hump yards for the purpose of instructing new men in the operation of the brakes before they start working in hump service. As a result this railroad has sustained very few injuries because of a lack of knowledge of the manner in which the geared hand brakes operate.

(The report was accepted and the recommendation submitted to letter ballot.)

* * *



The passing of two Western Maryland fast freight trains hauled by articulated steam locomotives

Report of Committee on Wheels

A survey of the causes of failures in the several types of car wheels causing freight-train derailments

Cast-Iron-Wheel Specifications

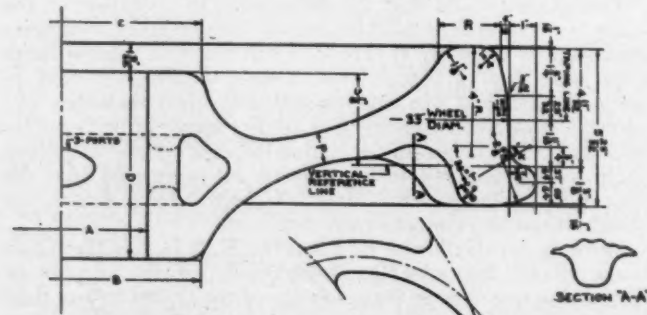
The committee recommends, as a letter-ballot item, that Section 9 (a) of Specifications M-403—Wheels, Cast Iron, for Locomotives, Tenders and Cars, be modified to conform with present inspection practices which promote greater accuracy and uniformity in the measurement of wearable chill, as follows:

Proposed Form: Chill Test.—The wheel selected for drop test and the wheel which has been given the thermal test shall be broken so that the chill may be examined in at least four different portions of the wheel. The depth of clear chill shall not be less than $\frac{3}{8}$ in. and effective chill shall not exceed 1 in. at the throat and $1\frac{1}{8}$ in. at center of tread. The blending of chill with the grey iron behind it shall be without distinct line of demarcation. The depth of chill shall not vary more than $\frac{1}{4}$ in around the tread in any one plane in the same wheel. These limits apply to all weights of wheels.

If the foregoing recommendation is approved, the photograph for minimum chill depth (Fig. 66-A in Supplement No. 1 to the Wheel and Axle Manual) will be properly marked and necessary changes made in other portions of the manual.

Cast-Iron Experimental Wheels

Recommendation to the General Committee was made that the authority which was granted in March, 1947, to manufacture and place in service under interchange freight cars 200,000 experimental cast-iron wheels, be extended to in-



	Car Capacity, tons		
	40	50	70
Nominal weight, lb.	700	750	850
Core size, A, in.	6	6 $\frac{1}{2}$	7 $\frac{1}{4}$
Hub diameter, back, B, in.	10	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Hub diameter, front, C, in.	10	10 $\frac{1}{2}$	11 $\frac{1}{2}$
Length of hub, D, in.	6 $\frac{1}{2}$	6 $\frac{1}{2}$	7
Thickness of Plate, P, in.	1	1-5/32	1 $\frac{1}{2}$
Thickness of rim, R, in.	2 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$
Thickness through throat, T, in.	2 $\frac{3}{4}$	2 $\frac{3}{4}$	2 $\frac{3}{4}$
Number of curved brackets, min.	18	18	18

Cross-section of the A.A.R. X-1 wheel

clude an additional 150,000 experimental wheels to the 1947 design and marked "AAR-XI". This recommendation was approved.

The committee recommends, as a letter-ballot item, that the 1947 design experimental cast-iron wheel marked AAR-XI, modified with respect to hub location and length, be adopted to supersede the 1944 revised Recommended Practice 33-in. cast-iron wheel for 40, 50, and 70-ton cars and, as an alternate, the same design but having a solid hub; the two propositions would become effective on March 1, 1950.

Study of Wheel Failures

A study of wheel failures in freight service which resulted in derailments was made for the entire year 1947 from a selected list of 33 of the larger railroads with approximately 80 per cent of freight car ownership. It represents 626 wheel

derailments, of which 110 were due to loose wheels which primarily involves wheel-shop practice, 53 or 11.18 per cent of the total cast-iron wheel failures and 52 or 34.21 per cent of the total steel wheel failures being in this classification. The wheel condition causing derailment was unknown in five cases. The remaining 511 cases may be classified as true wheel failures, wheels broken or worn beyond limits, 412 or 86.92 per cent of the total cast-iron wheel failures and 99 or 65.13 per cent of the total steel wheel failures being in this classification: Of the 511 cases, 80.6 per cent were cast-iron wheels and 19.4 per cent were wrought-steel wheels.

The 33 selected roads were also canvassed as to the number of wheels of various types under their freight equipment as of July 1, 1947, with the following result:

	Number In service	Per cent of total
Cast-iron wheels	8,178,712	65.2
One-wear wrought-steel wheels	2,459,120	34.8
Multiple-wear wrought-steel wheels	1,863,552	
Cast-steel wheels	39,664	
Total	12,541,048	100.0

As result of these studies over the past several years, the committee recommends, as letter-ballot items, that, as a safety measure, provisions be established in the Interchange Code to provide:

1. That effective January 1, 1950, all 700 and 750-lb. single-plate non-bracketed cast-iron wheels cast prior to 1938 be prohibited on cars in interchange service.
2. That effective January 1, 1952, all 700 and 750-lb. single-plate non-bracketed cast-iron wheels cast after January 1, 1938, be prohibited on cars in interchange service.

Tape Size Marking Color

Authorization granted in circular letter dated Feb. 15, 1947, for the use of a durable grade of white paint was withdrawn on Jan. 2, 1948, and the manufacturers instructed to revert back to the use of chrome yellow paint for stenciling tape sizes on rolled-steel wheels as specified in Specifications M-107.

Wheel Designs

Recommendation for a fourth class of heat-treated wheel, of intermediate carbon content between Class B and Class C wheels under A.A.R. Specifications M-107, for Diesel locomotive service, on the theory that it would combine better resistance to both shelling and thermal checking, is being studied. Data is being developed through a questionnaire to the member roads and progress only is reported.

The committee recommended, as a letter-ballot item, the adoption as an alternate standard of a design of cylindrical wheel tread as follows with 2 in. of cylindrical tread, $1\frac{1}{8}$ in. taper at 1:20, and a $\frac{5}{8}$ -in. radius between the tapered part of the tread and face of rim.

Contingent upon the foregoing receiving letter-ballot approval, Sections 2 and 14 (a) of Specifications M-107 will be revised so that standard taper tread is to be furnished unless alternate standard cylindrical tread is specified on purchase order. In paragraph 14 the words "unless otherwise specified" will be eliminated.

The committee recommended, as a letter-ballot item, that wheel designs F-33, CX-38, BX-40, DX-40 and CX-50 be withdrawn from the standards and temporary standards now shown in Manual Section G.

The committee recommended, as a letter-ballot item, that in the designs of cast-iron wheels the distance from vertical reference line to the outside hub face be $3\frac{3}{8}$ in. and the nominal hub length not exceed 7 in. to permit the standardization of wheel-hub location and wheel-seat location.

Change in Gauge Hardness

The secretary was instructed to change editorially the

minimum hardness value of "C-65 Rockwell" shown on Manual page B-42-F to a minimum hardness of "C-60 Rockwell," for the worn-through-chill and out-of-round gauge, as announced in circular letter dated December 5, 1947.

[The failure of Diesel locomotive wheels due to the stamping on the back face of the rim was investigated, but the situation was not considered to warrant elimination of the stamping.—Editor]

Wheel Defects

Elimination of Interchange Rule 83 is being recommended by the Arbitration Committee and the secretary has been instructed to correct editorially the Recommended Practices appearing on Page G-11 of the Manual and Page 72 of the Wheel and Axle Manual by eliminating reference to "Rule 83" from the descriptive text of defects for A. A. R. Wheel Symbols 83 and 83-A.

An editorial correction was authorized in Paragraph 277 in the next printing of the Wheel and Axle Manual or supplement thereto, by adding to the third sentence the words "if wheel has a sharp or vertical flange."

Inquiry was made concerning the use of the Sperry Reflectoscope in lieu of Magnetic Particle Testing. The Reflectoscope is not as sensitive to detection of surface defects in journal, and the shape of the car axle is such that failure would have to progress materially before detection due to axle design. This device will not come within the scope of Paragraph 355 (o).

Modifications to Manual

To Page G-27, Section 1—Inside Diameter—Back Face of Rim; editorial modification was made by substituting for the words, "that specified," the following:

Proposed Form—"the nominal dimension. The maximum diameter at this location is governed by the rim thickness and the tape size."

To Page G-27, Section 2 Inside Dimension—Front Face of Rim; recommendation was made, as a letter ballot item, for the following revision:

Proposed Form—Inside Diameter—Front Face of Rim.—The inside diameter of the rim at the front face of the wheel shall not exceed that at the back face of the wheel and shall not vary under this dimensions by more than $\frac{1}{4}$ in. for multiple-wear wheels. For one-wear wheels, the inside diameter shall not differ from that at the back face by more than $\frac{1}{4}$ in.

The committee recommended, as a letter-ballot item, that the second sentence of Paragraphs 209 and 355 (o) of the Wheel and Axle Manual, as shown in Supplement No. 1, be revised as follows:

Proposed Form—All secondhand axles shall be magnetic particle tested before remounting. If journal surface or end of axle has *any discoloration* due to overheating (*light straw or dark straw or any departure from the normal bright finish of the journal*), or if circumferential checks or cracks are found in journals, (etc.—no other change).

The members of the Committee on Wheels are E. E. Chapman (chairman), mechanical assistant, A. T. & S. F.; H. H. Haupt (vice-chairman), general superintendent motive power, Pennsylvania; I. N. Moseley, research and test engineer, N. & W.; M. S. Riegel, assistant engineer of tests, N. Y. C.; H. E. Wagner, superintendent car department, A. & S.; G. A. Harstad, foundry metallurgist, C. M., St. P. & P.; A. M. Johnsen, engineer of tests, Pullman Company; W. R. Hedeman, engineer of tests, B. & O.; P. V. Garin, engineer of tests, Sou. Pac.; F. Holsinger, wheel-shop foreman, I. C.; B. C. Gunnell, chief mechanical engineer, Southern.

Discussion

C. E. Bryant, chief engineer, Technical Board, Wrought Steel Wheel Industry, referring to the section of the report which dealt with the Diesel locomotive wheels, said that the conditions under which these wheels operate represent an entirely new type of wheel service. The heat effects from brake shoes, he said are probably the major factor for consideration in wheel design for Diesel locomotives. He compared the requirements of three types of wheel service, one under a conventional pre-war passenger car weighing 190,000

lb. and carried on six-wheel trucks, with a load per wheel of about 15,800 lb. To stop such a car from 60 m.p.h. requires the dissipation of 1,900,000 ft. lb. of energy. The second service condition was represented by a post-war passenger car weighing 140,000 lb. and carried on four-wheel trucks with an average weight per wheel of 18,000 lb. To stop this car from 90 m.p.h., he said, required the dissipation of 4,900,000 ft. lb. energy—about $2\frac{1}{2}$ tons as much as under the former conditions. The Diesel locomotive represents the third set of conditions in which the wheel load is about 28,000 lb. Stopping the locomotive from 60 m.p.h. of this load requires the dissipation of 3,350,000 ft. lb.; to stop the locomotive from 90 m.p.h. requires the dissipation of 7,600,000 ft. lb. He pointed out that braking ratios do not provide a significant comparison unless they are directly associated with the wheel load. A moderate braking ratio applied to the high wheel loads of the Diesel locomotive may give more trouble than a high braking ratio applied to the lower wheel loads on passenger cars.

These figures, he said, served to outline the problem and both the committee and the steel-wheel industry were trying to find an answer but, he said, there are limits to the capacity of all steels. While the answer was not yet available he reminded the members that the railroads had faced similar problems before in the case of axles, and firebox sheets in high pressure oil burning steam locomotives. A limitation on carbon steel arises mainly from the fact that it is a heat-treated material. Because of the high heat input from braking the heat treater cannot go as far as it might. The only high-alloy steels now known which might meet these conditions are too expensive. Perhaps, he said, some suitable low alloy steel may ultimately be found, but it is not yet available.

C. M. Stoner, executive vice president, Association of Manufacturers of Chilled Car Wheels, said that the adoption of A.A.R.—X-1 chilled iron wheel as standard, was constructive. The greatest improvement in the chilled wheel, he said, has been in tread strength. The production of the wheels with the improved tread and rim metal, he said, was increasing. The information on wheel failures in the report of the committee agreed with the information which the chilled-wheel manufacturers had collected, and there has been a distinct improvement in wheel failures, he said, on wheels which have been cast during the past 10 years.

Several other points were brought out during the discussion. Exception was taken to the increase of rim thickness of steel wheels from $2\frac{1}{2}$ in. to $2\frac{3}{4}$ in. The question was raised whether increase in service metal was worth the cost since sometimes it could not be used. To take advantage of it tends to aggravate the difference in diameter between new wheels and worn wheels when both are used on the same car. The question was raised whether it would not be possible to provide a stamp of such form that its use on the inside of the rim would not produce a notch effect referred to in the report.

There was some criticism of the requirements of magnetic testing of axles between the wheel seats—this was referred to as one of the examples of the constant trend toward increasing costs referred to in the discussion of the Car Construction report. Mr. Chapman, in answering this criticism, admitted that there was not complete agreement among the members of the committee on this matter. He cited an instance of a destructive derailment cause by a failure of an axle between wheel seats, the avoidance of which, he said, would justify all of the expense involved in the use of the Magnaflux test. Agreement with the committee on its suggested intermediate carbon range for Diesel locomotive wheels was expressed by one member.

(The report was accepted and its recommendation submitted to letter ballot.)

FREIGHT-CAR LOADINGS.—Freight-car loadings in the third quarter of 1948 are expected to be 3.7 per cent above those in the same period in 1947, according to estimates made by the Shippers Advisory Boards. On the basis of those estimates freight-car loadings of the 32 principal commodities will be 9,138,374 cars in the third quarter of 1948 compared with 8,814,081 actual car loadings for the same commodities in the corresponding period last year.

Committee on Car Construction

Consideration given to many details in report covering features of car design

Since 1936 your committee has, each year in its annual report, made a statement of the freight cars ordered during the preceding year. Sufficient detail is given in these statements to indicate the extent to which the members were following A.A.R. standardization for these cars.

[The report included three tables showing that, except for 4,025 50-ton hopper cars of non-A.A.R. design and all refrigerator cars, a total of 71,662 new house and hopper cars, ordered May 1, 1947, to April 30, 1948, were A.A.R. through-out, or conforming thereto, including lightweight alloy steel to A.A.R. base dimensions, floating center sills and inside dimensions to meet specific conditions. Of 108,634 cars of all types listed in the tables, 105,516 have A.A.R. standard 25 $\frac{3}{4}$ -in. centerplate height; 118 have 25 $\frac{1}{8}$ -in. center-plate height and 3,000 have 26 $\frac{3}{4}$ -in. center-plate height. The committee also reported approval for interchange service of 12 new designs of freight cars, involving a total of 1,209 cars to be built for 12 car owners.—Editor.]

It was decided that prints and specifications for designs of new cars developed by various car builders, which vary to some extent from conventional designs but not to the extent they would be classified as "untried types" under Interchange Rule 3, should be submitted to the secretary for inclusion in his files as a matter of record.

In such cases it will not be necessary to submit approval applications to the committee, nor will the builder be required to obtain A.A.R. approval of the car design before starting construction, it being understood the car owner will be held responsible for compliance with Interchange Rule 3 with safety appliance requirements.

Each railroad should request car builders having orders for its cars which vary from, but are based on conventional de-

signs, to submit one set of prints and specifications to the secretary for his file (who will notify the committee upon receipt thereof).

In October, 1947, the Operating-Transportation Division by letter ballot action adopted the clearance outline, shown as new Plate B, and added new Par. (e) to Car Service Rule 14 for the purpose of placing these limiting dimensions on freight cars to be handled in general interchange service without penalty.

A recommendation from your committee to adopt a standard limiting outline for freight cars, as shown by the solid line contour of new Plate B, to replace Figs. 1 and 2 on present Plate B in Supplement to Manual, was referred to letter ballot of the Mechanical Division as Proposition No. 1 in Circular DV-1150, dated December 31, 1947, and was approved by a large majority; the results being announced in Circular No. DV-1151, dated February 12, 1948. In accordance with this approval, arrangements are being made to include with the next set of revised and additional pages for the Supplement to Manual, new Plate B, illustrated.

Loading Devices in Automobile Cars

Early in 1946, the attention of the A.A.R. was forcibly directed to the increase in number of claims resulting from damage to automotive equipment loaded in special loader-equipped box cars due to failure of the auto-loader equipment. The automobile industry complained of the condition of the auto-loader equipment in cars offered to them as good-order equipment for shipment of their products, also, a number of personal injuries were reported as the result of faulty equipment. This condition brought about an increase in the number of inspectors required prior to loading and also necessitated removing defective cars from loading docks and transferring them to repair yards in the immediate vicinity. Consequently, an unusual load was placed upon the handling line and was out of proportion to the number of cars in the handling line ownership, largely because the other railroads, failed to make repairs to their own equipment.

As a result of these conditions W. C. Kendall, chairman, Car Service Division, A.A.R., brought this matter to the attention of the Car Construction Committee on July 3, 1946. The defects reported were analyzed and detail remedies were given in a circular letter dated August 14, 1946, prepared by the Car Construction Committee, and sent to the voting and associate members.

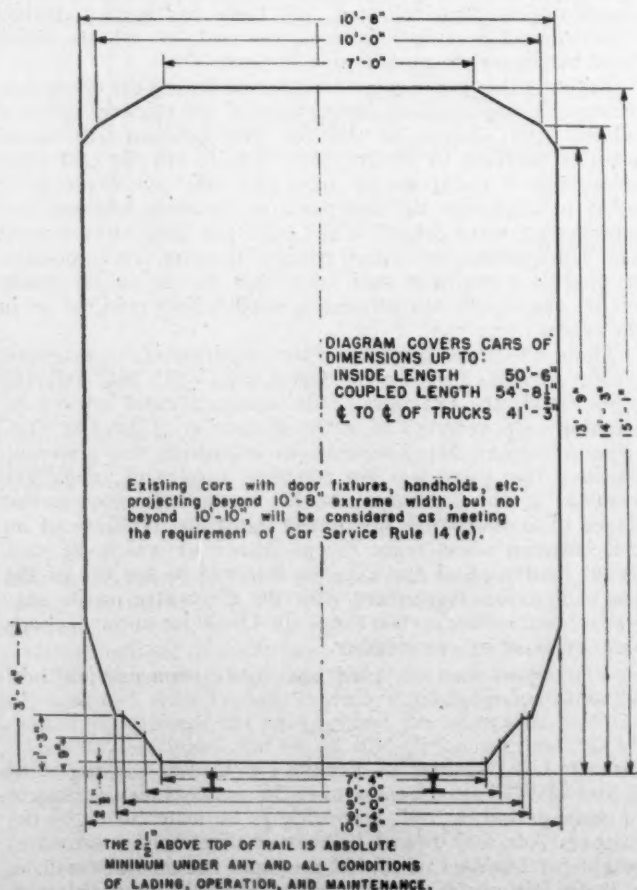
This subject was further discussed at a joint meeting of the A.M.A. Traffic Committee and Engineering Loading, Special Subcommittee of the A.A.R. Car Construction Committee, and Special Subcommittee of the Automobile Committee, Railroad Claim Section, with the result that a supplemental letter, dated February 3, 1947, containing additional reported defects, was issued to circular letter dated August 14, 1946.

The conditions continued to remain critical in the loading field and progress in repairing loaders was slow. A third circular letter was, therefore, issued on February 12, 1948, which included a summary of the previous letters and some additional data. This circular letter was also sent out to voting and associate members and was widely distributed. As a result, there has been a considerable reduction in damage claims as well as a reduction in the number of complaints received from the loading points.

(This part of the report was signed by Sub-committee Chairman J. A. Grower.)

Car Design—Steel-Sheathed Box Cars

Since the introduction of the A.A.R. standard box cars of 10 ft. 6 in. inside height, there has been little demand for designs of the 10 ft. 0 in. inside height. Your committee, therefore, at its October, 1947, meeting decided to revise drawings of the 40-ft. 6-in. box car to change the inside height from 10 ft. 0 in. to 10 ft. 6 in. and other affected dimensions. Other corrections were authorized such as: Metal running boards to replace wood; diagonal panel roof to replace solid



New Plate B—Equipment diagram—Unrestricted for interchange service

steel roof; and modern side-door designs of the corrugated and panel types.

(The report here included a general discussion of the freight truck research program described in the General Committee report.)

The committee concurs in the action of the Committee on Specifications for Materials, as recommended in its 1948 report, that new Sec. 23 (c) (present section 23c to be redesignated 23d) be added to Spec. M-101: "(c) For smooth forged axles, the maximum permissible throw or run-out at center of the axle, after rough turning of journals and wheel seats, shall be 1/4 in."

To provide a gauge for measuring the throw or run out in cases, design as shown by Figs. 2 and 3, (not included in this abstract of the committee's report) have been prepared. It is recommended that this design of gauge be submitted to letter ballot for adoption as recommended practice and, if approved, included in Sec. B of the Manual of Standard and Recommended Practice.

Side Frames and Bolsters

Considerable misunderstanding on the part of many railroads as well as on the part of the manufacturers involved has existed for several years regarding A.A.R. requirements for truck side frames and bolsters for freight cars. This was probably due to the fact that in order to ascertain what all of the requirements were it was necessary to consult not only the Book of Interchange Rules and the Manual, but also various D.V. circulars.

Last year this situation was clarified by a revision in A.A.R. Specifications M-203 and M-202, covering side frames and bolsters, respectively, incorporating for the first time in these specifications all of the essential requirements. These revised specifications were submitted to letter ballot and received unanimous approval.

There still remained the necessity of formulating a set of regulations to simplify and systematize as much as possible the procedure for handling applications for approval. With this object in view, a joint meeting was held on November 21, 1947, in Chicago by the A.A.R. Joint Subcommittee on Side Frames and Bolsters and representatives of all the leading manufacturers.

At this meeting the Regulations Governing Applications for Approval of Side Frame and Bolster Designs were unanimously agreed upon. Since that time a few minor modifications have been requested by the manufacturers and approved by the Joint Subcommittee.

A copy of these regulations as they now stand is given in Exhibit A (not included in this abstract of the committee's report).

Side Frames and Bolsters Approved During the Past Year

Immediately following the revision last year of the side frame and bolster specification, and the adoption of the regulations governing applications for approval, your subcommittee was deluged with new applications. This was due to the fact that, partly through misunderstanding, some manufacturers had been producing for a number of years side frames and bolsters which had never been submitted for approval or subjected to A.A.R. tests.

All of the principal manufacturers have shown a gratifying disposition to cooperate fully and the chief difficulty at present arises from the fact that only two dynamic testing machines are in existence and both of them are worked to capacity. Dynamic tests are of course waived in all cases permitted by the regulations; but, even so, a considerable backlog of test work exists at present.

Side-frame and bolster designs approved since our last report number 230 and 257, respectively. In the tabular list of all approvals to date, each approved side frame and bolster is assigned an identification number and this practice will be continued. The purpose for which these identification numbers are to be used is explained below.

Identification of Approved Frames and Bolsters

One of the reasons why it has been so difficult to enforce design test requirements for side frames and bolsters in the past has been that a laborious procedure of checking pattern numbers against records of approval was required in order

to determine whether any given design had been approved or not. To eliminate this difficulty insofar as possible, it is recommended that existing marking clauses in Spec. M-202 and M-203 be revised. Details of the revision are omitted from this abstract.

(This part of the report, submitted by Subcommittee Chairman H. W. Faus, was followed by Exhibit A—Regulations governing application for approval of side frame and bolster designs under latest issues of Specifications M-203 and M-202, respectively: also a 56-page table listing individual types of side frames and bolsters approved for interchange freight service.—Editor)

Service Tests of Helical Springs

The Subcommittee on Helical Springs for Freight Cars installed in a road service life test the following: 100 car sets with A.A.R. 1936 springs, T-1; 100 car sets with proposed 1944 springs, T-2; 100 car sets with 2-in. travel springs, T-3; 10 car sets with 2 1/2-in. travel springs, T-4, under Berwind-White Coal Mining Company cars which are confined to the same territory.

Results of Helical Spring Tests Running 26 Months and to April 1, 1948:

Spring designation	Travel (in.)	No. failures		Cars still in service life test
		Outer	Inner	
T-1	1 3/4	8	1	99
T-2	1 3/4	33	1	97
T-3	2	64	7	95
T-4	2 1/2	3	0	10

A total of 76 of these broken springs has been returned to the Crucible Steel Company of Pittsburgh, and the Railway Spring Manufacturers Technical Committee, after thorough investigation of these failures, reports that: (a) The majority of the failures occurred two coils or less from the end; (b) practically all of the failures can be attributed to fatigue as only two could be attributed to seamed bars; (c) excluding these two exceptions, nothing was developed in the investigation that would indicate that either material or manufacture was responsible for these failures.

This test is continuing, failures are being reported, and compiled, but no conclusions shall be drawn nor any predictions made as to final results until sufficient failures have been recorded to warrant a precise trend.

The three class T-4 springs (2 1/2 in. travel) reported broken were discovered on one car on which all four snubbers were found broken at the same time; therefore, these spring failures apparently were a resulting effect rather than a contributing cause.

(This part of the report was presented by Subcommittee Chairman J. R. Jackson.)

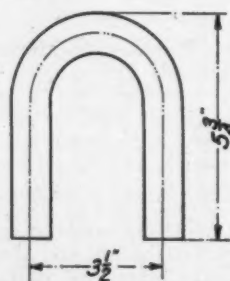
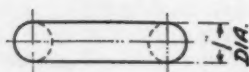
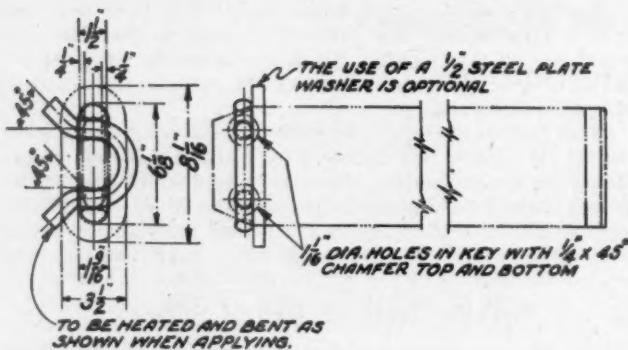
Cooperating with a subcommittee of the Truck Manufacturers Engineers Committee, the National Malleable & Steel Castings Co. and the Committee on Car Construction, A.A.R. plates covering design dimensions and gauges for Classes A, B, C, D, E and F integral and separate journal boxes have been revised as follows, for inclusion in the next set of revised Manual pages: Including Plates D-14 to 25, incl., also Plate B-30, as corrected and Plates D-15A and B-32, 33, 34, B-34-A, covering the bushing hinge-lug pin hole and application of wear liners on hinge lug and various gauges.

Brake Beams

Reports of brake-beam failures due to tension rods breaking in threads at the base of the nuts, resulting in serious delays and expensive derailments, have been a matter of concern and extensive study by the subcommittee in cooperation with the Mechanical Committee of the Brake Beam Manufacturers' Association.

Some changes were recommended in the present Standard A.A.R. No. 15 brake beam in the 1946 annual report, but it was the unanimous opinion of the subcommittee that an entire new design of brake beam should be developed that would not have inherent weaknesses of the present A.A.R. No. 15 or No. 3 beams.

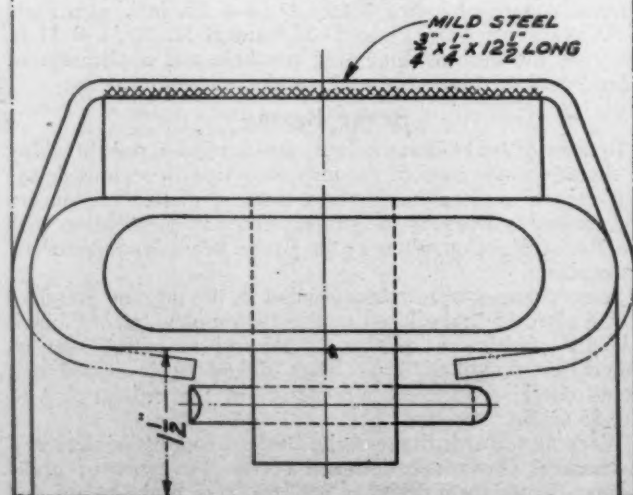
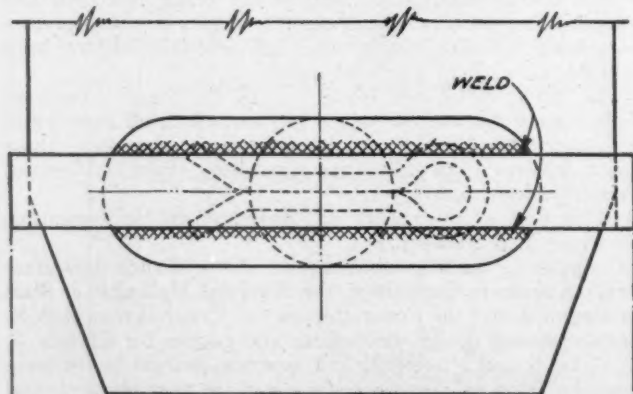
Working towards that end the Brake Beam Manufacturers' Mechanical Committee designed seven new types of brake beams; two of them designed for Unit-type brake beams and the other five standard type requiring standard brake-beam hangers.



DRAFT KEY RETAINER
FORGED STEEL

C-28C—Alternate standard draft-key retainer, adopted 1932; revised 1948

Arrangements were made for road and laboratory tests of the seven new designs in comparison with the present A.A.R. No. 3 beam. The A.A.R. No. 3 beam was selected as the best beam for these tests because this beam is stronger than the

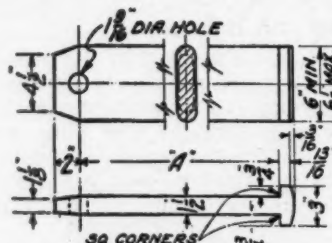


C-28D—Alternate standard draft-key retainer lock, adopted 1945; revised 1948

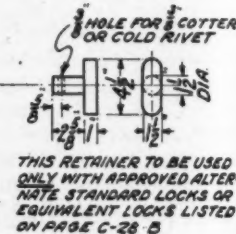
No. 15 beam and the committee is trying to develop a beam that will be better than present A.A.R. No. 3 beam.

(This part of the report was presented by Subcommittee Chairman L. M. Kueck.)

As suggested by the Arbitration Committee, a joint subcommittee consisting of representatives from that Committee, the Committee on Car Construction, and Coupler and Draft Gear Committee, was appointed to consider the matter of proper space between top of coupler and top surface of the opening on the striking castings, on new as well as existing equipment, with a view of incorporating mandatory requirements in the Interchange Rules to cover. Complete and final report on the subject is not in shape at this time for presentation to the member roads but, as a protection in the construction of new cars, it is recommended for adoption by letter ballot that the following new item 19 be added in "Fundamentals of Design" appearing on page C-4 of the Manual of Standard and Recommended Practice.

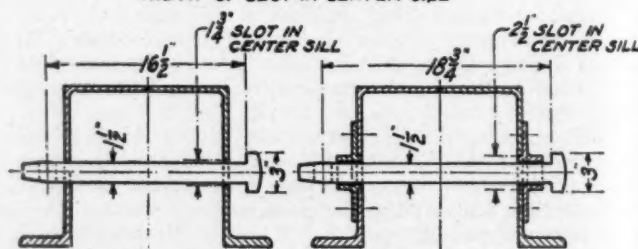


DRAFT GEAR KEY
CARBON STEEL QUENCHED & TEMPERED
DIM. A = 16 1/2 FOR VERTICAL YOKES
DIM. A = 18 3/4 FOR HORIZONTAL YOKES



THIS RETAINER TO BE USED
ONLY WITH APPROVED ALTERNATE
STANDARD LOCKS OR
EQUIVALENT LOCKS LISTED
ON PAGE C-28-B

TYPICAL APPLICATIONS
WIDTH OF SLOT IN CENTER SILL



VERTICAL YOE HORIZONTAL YOE

C-28F—Draft-key retainer and key slot in center sills

"19—Vertical spacing between top of coupler shank and bottom of striking casting (maximum 7/8 in. 7/8 in.)."

Draft Key Retainers

Reports of failures of draft key retainers which have in a number of cases resulted in derailment and extensive damage, have demonstrated that the present standard method of securement of cross keys is inadequate.

As instructed, the Joint Subcommittee on Draft Key Retainers (consisting of representatives of the Car Construction and Coupler and Draft Gear Committees) met in New York City on April 30, 1948, and unanimously approved the following recommendations covering draft-gear key retainers:

- 1.—Insert new Page C-28B in the Manual in accordance with copy attached.*
- 2.—Revise present Plate C-28B and renumber as C-28F in accordance with drawing.
- 3.—Revise Plate C-28C in accordance with drawing.
- 4.—Revise Plate C-28D in accordance with drawing.
- 5.—All cars built or rebuilt after January 1, 1949, must be equipped with approved alternate standard, or approved equivalent draft-key retainers, and all cars in interchange must be so equipped by January 1, 1951.

*This copy shows proprietary designs of retainers are approved equivalents to the above alternate standard types: Azee Draft Key Retainer Assembly, Illinois Railway Equipment Company; Positive Draft Key Retainer Lock, Drawing No. 601, Illinois Railway Equipment Company; Universal Draft Key Retainer, Universal Draft Gear Attachment Company; Surelox Draft Key Retainer, Western Railway Equipment Company. Note: Positive Draft Key Retainer, Drawing No. 426, Illinois Railway Equipment Company, may be continued in service until necessary to renew.

Letter Ballot Items

The following recommendations contained in this report are submitted for adoption by letter ballot of the members:

Revision of Sec. 6—Marking of Sec. M-202 and M-203 covering truck bolsters and truck side frames, respectively.

Adoption as recommended practice gauge for measuring throw or run out at center of axle.

Adoption as recommended practice gauges as shown on Plates B-32, B-33, B-34, and B-34A for journal boxes and lids.

Adoption as recommended practice journal-box hinge lug and pin-hole bushing for Class A, B, C, D, E, and F journal boxes as shown on Plate D-15A.

Adoption of new Item 19 under Fundamentals of Design (Manual page C-4).

Adoption of new and revised Manual plates C-28B, C-28C, C-28D and C-28F, covering draft key retainers.

Deletion from, modification of and additions to Sec. B of the Fusion Welding and Bronze Welding Limits and Regulations, appearing in Sec. L of the Manual, as follows: Elimination of items covering arch bars and tie bar, addition of item to cover welding of geared hand brakes, modification of item covering solid axles, addition of item to cover restriction on welding of metal running boards.

Adoption as standard arrangement and details of hold-down clips for gondola cars as shown on Plate 803-A and revision of General Arrangement Plate 800-A covering 50-ton 41-ft. 6-in. lightweight high-side gondola car to show a similar arrangement of hold-down clips.

Addition to and deletion from Recommended Practice "Classification of Cars. Definitions and Designating Letters of," appearing in Section L of the manual, as follows: Adoption of new Designation "PBO" and definition for coach observation dome car; Elimination of designation "SPR" and definition for combination poultry and refrigerator car.

Revision of Recommended Practice for Placard Boards and Routing Card Boards as covered by Supplement to Manual Plates 246, 250, 1531-A to 1534-A, inclusive, and page C-42 of the Manual of Standard and Recommended Practice.

The members of the Committee of Car Construction are T. P. Irving (chairman), engineer car construction C. & O.; J. A. Gower (vice-chairman) assistant mechanical engineer, Pennsylvania. R. B. Winship, mechanical engineer, Can. Pac.;

J. McMullen, consulting engineer, Erie; R. D. Bryan, mechanical assistant, A.T. & S.F.; R. H. Graff, assistant engineer rolling stock, N.Y.C.; W. A. Pownall, assistant to general superintendent motive power, Wabash; L. H. Kueck, assistant chief mechanical officer, Mo. Pac.; J. K. Peters, mechanical engineer, D. & R.G.W.; H. L. Holland, assistant mechanical engineer, B. & O.; L. R. Schuster, engineer car construction, S.P.; M. C. Haber, acting general mechanical engineer, U.P., and F. G. Moody, superintendent car department, N.P.

Discussion

This committee was said to have a greater responsibility than commonly realized and that railroads will "sink or swim," dependent largely upon what they do with car equipment, so said one member, who called attention to the present cost of upwards of \$5,000 for a box car, as compared with \$1,000 or slightly more, 25 years ago, and he said that new Association of American Railroads rules and legislative action almost invariably increase costs. He suggested the urgent need for changes and improvement which will decrease costs.

With inadequate depreciation reserves, he asked where the money is coming from to purchase badly needed new car equipment. He referred to various details of freight-car design such as trucks, brake beams, running boards and hand-brake wheels and suggested that the committee give more consideration to entirely new designs which are forward looking, can be produced economically and are, in many instances, entirely outside present A.A.R. specifications. In reply, Chairman Irving stated that the committee will welcome and give due consideration to any new designs of car details which are submitted to it and promise to improve service or reduce costs.

Another member called attention to the difficulty in maintaining standard coupler and platform height and levelling cars on streamline passenger trains which operate as unit trains over more than one railroad. He said the handling line should be recompensed for the time and labor involved in adjusting side bearings and urged the respective committees to give prompt attention to this matter and, if possible, develop designs which are more easily adjustable.

(The report was accepted and the recommendations submitted to letter ballot.)

Modifications of Tank-Car Specifications

Changes made because of shortage of flange steel—Number of Welded Test Plates reduced

During the past year the committee was called upon to give consideration to a total of 443 dockets and applications for approval of designs. Two hundred and thirty-four applications covered designs, materials and construction of 6,613 new shipping containers, for mounting on new cars or for replacement on existing cars. Four applications covered the construction of twenty-three multiple unit cars to be used for the transportation of fifteen Class I.C.C.-106A500 one-ton containers each. One application covered the construction of one new car structure for the mounting of an existing cylindrical wooden tank-car tank.

One hundred and eighty-three applications covered alterations in, additions to, or conversions and deconditioning of 3,651 existing tank cars or shipping containers. Twenty-one applications requested approval of tank-car appurtenance designs or materials without reference to specific cars.

Specifications for Tank Cars

Because of the inability of the builders to secure open-hearth boiler-plate steel of flange quality for construction of tank-car tanks the General Committee, upon recommendation of the Committee on Tank Cars, concurred in by the Bureau of Explosives, approved modification of the A.A.R. specifications for Tank Cars of Classes ICC-103-W, ICC-103A-W, ICC-103B-W, ICC-104-W, ICC-104A-W, ICC-105A300-W,

ICC-105A400-W, ICC-105A-W, and ICC-105A600-W at paragraph AAR-3 (a) to read as follows:

"AAR-3. (a) All plates used for tank and expansion dome, where expansion dome is required, must be of open-hearth boiler-plate steel of flange quality complying with requirements of current A.A.R. Specification M-115, titled Steel, Carbon and Carbon-Silicon, Boiler and Firebox, for Locomotives, Stationary Boilers and Other Pressure Vessels or A.S.T.M. Standard Specifications A-212 titled High-Tensile-Strength Carbon-Silicon Steel Plates for Boilers and Other Pressure Vessels, Grade A and Grade B, Flange and Firebox, with the carbon content of the plates used not to exceed 0.30 per cent. These plates may also be clad with other metals, such as nickel, etc."

The General committee, upon recommendation of the Committee on Tank Cars, concurred in by the Bureau of Explosives, has also approved a further modification of the A.A.R. Specifications for tank Cars of Classes ICC-103, ICC-103-A, ICC-104, ICC-104-A, and AAR-203 at paragraph AAR-8 (a) to read as follows:

"AAR-8 (a) Electric seal welding of inside calking edges only, in whole or in part, using shielded-arc type of electrode is permitted on new or existing equipment, provided the weld bead has a $\frac{1}{8}$ -in. minimum to $\frac{3}{16}$ -in. maximum throat thickness. Qualification of welders must comply with

requirements of specification ICC-103-W, paragraphs AAR-6 (k-1) to (k-5), inclusive. Welding clad material to edge of clad plates inside of tank is permitted. Other methods of covering edges of clad plates, if approved, may be used."

Welded Test Plates Reduced

Upon request, the committee gave consideration to a reduction in the number of test plates to be prepared as prescribed by the specifications for fusion-welded tanks of Classes ICC-103-W, ICC-103A-W, ICC-103B-W, ICC-104-W, ICC-104A-W, ICC-105A-300-W, ICC-105A400-W, ICC-105A500-W, and ICC-105A600-W. The General Committee has approved of the recommendation and authorized revision of paragraph AAR-6 (d-3) of each of the above specifications to read as follows:

"AAR-6. (d-3) When there are several tanks being welded in succession, or at any one time, the plate thicknesses of which fall within a range of $\frac{1}{4}$ in., each 200 ft. of longitudinal and circumferential seams may be considered as the equivalent of one tank and only the test plates required by paragraphs AAR-6 (d-1) and AAR-6 (d-2) need be made, provided they are welded in the same way as the joints in question. When the manufacturer is in the regular and continuous production of ICC-103-W, ICC-103A-W, ICC-103-W, ICC-104-W, ICC-104A-W, ICC-105A-300-W, ICC-105A400-W, ICC-105A500-W, and ICC-A600-W only one test plate need be made for one tank out of 20, of any of these classes, provided a minimum of one test plate per week for any of these classes is made. The test plates shall be so supported that warping due to welding shall not throw the finished test plate out of line by an angle of over five degrees."

The members of the Committee on Tank Cars are R. D. Bryan (chairman), mechanical assistant, A.T. & S.F.; L. R. Schuster, (vice-chairman), engineer car construction, S.P.; O. H. Clark, superintendent car department, Mo. Pac.; E. R. Hauer, chief mechanical engineer, C. & O.; E. O. Joest, mechanical engineer, U.P.; A. A. Ott, chief car inspector, Pennsylvania; D. S. Clark, assistant to head, School of Mechanical Engineering, Purdue University; J. J. Root, Jr., vice-president, Union Tank Car Company; R. T. Baldwin, secretary, Chlorine Institute, Inc.; H. J. Gronemeyer, supervisor car equipment, E. I. du Pont de Nemours & Co.; R. W. Thomas, manager, research and development, Phillips Petroleum Company and T. G. Rabbitt, superintendent tank cars, Sun Oil Company.

(The report was accepted.)

Loading Rules Revisions

All subjects handled by the Committee on Loading Rules for the past year have been included in Supplement No. 1 to the June 15, 1947, issue of the Open Top Loading Rules, dated May 15, 1948.

The American Iron and Steel Institute Subcommittee on Loading Rules met with a subcommittee of the A.A.R., and a number of the important revisions to the various methods of loading steel products as contained in Supplement No. 1 are the result of careful planning and study by these subcommittees. The new methods of loading were only adopted after shock tests had been conducted at various shippers' plants, and numerous shipments forwarded under experimental load cards to determine the effectiveness of the proposed methods.

Farm and Road-Making Machinery

The Traffic Committee of the Farm Equipment Institute met with the Committee on Loading Rules for the purpose of discussing revision of the tractor rules to overcome the difficulty that was being experienced with machines falling off cars enroute. The Farm Equipment Institute appointed two subcommittees, one to cover crawler-type tractors, and one to cover wheel-type tractors, to meet with the A.A.R. subcommittee. Revised figures, as well as the new figures, have been completed and are included in Supplement No. 1.

The Traffic Council of the Grading and Road Making Industry also selected a committee from their group for the purpose of working jointly with our committee in the prepara-

tion of suitable loading specifications to govern the loading of grading and road-making equipment on flat cars. A program is under way to establish definite loading specifications and drawings for the various types of grading and road making equipment, as well as any necessary modifications which might improve the present loading specifications. It is hoped this assignment can be completed during the year, and all pertinent information, including specifications, drawings, photographs, etc., included in a separate pamphlet to the Open Top Loading Rules and issued to all concerned.

War Assets Loadings

It was brought to the attention of the Committee on Loading Rules that considerable confusion exists in the preparation, handling, blocking and in inspection of machinery for shipment from War Assets storage depots and other sources, which is resulting in excessive damage claims. Some of the conditions reported are as follows: (1) improper blocking of the movable parts of machines equipped with traversing tables, movable heads, rotating parts, suspended motors panels, cages, etc.; (2) improper securement of counterweights; (3) loose cap screws, studs, shaft keys, etc.; (4) improper type and sizes, as well as broken and deteriorated skids; (5) suspended motors, gear boxes, control panels, etc.

It is the responsibility of the railroads to ascertain that shipments are prepared in accordance with the methods outlined in the Special Supplement containing regulations and diagrams covering the loading of machines on flat or in gondola cars, which was issued by the Mechanical Division of the A.A.R. under date of August 15, 1945, and which is effective until rescinded. The railroads should impress upon the shippers, regardless of the representatives preparing the shipments, the importance of properly securing the attachments and movable parts of the machines, as well as the proper blocking of the machines themselves on the car.

In an effort to substantiate claims for improvement in existing figures covering various products, the Committee on Loading Rules has repeatedly, through the secretary, requested information from the carriers regarding disarrangement of lading enroute. While only a small portion of the loads adjusted are reported, those received do not reflect sufficient information to convince the shippers that increased loading expense is justified. Your committee again urgently requests that all pertinent information regarding failure of shipments enroute be properly transmitted to the secretary, in order that the matter can be handled intelligently with the shippers.

Requests are often made by member roads for increased securement on commodities which have become disarranged enroute. However, after careful study of the reports accompanying such requests the committee frequently finds that the trouble is confined to endwise shifting of lading which has been brought about by rough handling. This is a matter for the member lines to police, in so far as train handling and yard handling of loads susceptible to endwise shifting is concerned.

Each railroad should assign a competent man familiar with the Loading Rules to follow up the application of the rules, both with the employees and the shippers, in order to bring about a better understanding of the loading rules, and to insure proper loading. If such action is taken by the member lines considerable improvement will be brought about. It will also expedite the movement of shipments from point of origin to destination and should promote better relations between the shipper and the carrier. In addition to the above, it will materially reduce the expense now being incurred due to adjustments enroute and damaged conditions of lading upon arrival at destination, caused primarily by careless and improper loading, and, in our opinion, will be money well spent.

[In Section A the committee presented the specific revisions in Supplement No. 1 to the Open-Top Loading rules, and in Section B commented briefly on the 20 subjects still under consideration.—Editor]

The members of the Committee on Loading Rules are W. B. Moir (chairman), chief car inspector, Pennsylvania; C. J. Nelson (vice-chairman), superintendent of interchange, Chicago Car Interchange; T. W. Carr, superintendent rolling stock, P. & L. E.; A. H. Keys, superintendent car department, B. & O.; G. D. Minter, district car inspector, N. & W.; H. S.

Keppelman, superintendent car department, Reading; G. R. Andersen, superintendent car department, C. & N. W.; H. H. Golden, supervisor A.A.R. interchange and accounting, L. & N.; H. J. Oliver, assistant motive power (car), D., T. & I.; F. A. Shoulty, assistant superintendent car department, C.,

M. St. P. & P.; F. Fahland, mechanical engineer, U. P.; L. E. Day, district master car repairer (general shops), S.P.; L. T. Donovan, supervisor of A.A.R. Loading, Mechanical Division, A.A.R.

(The report was accepted.)

Report on Couplers and Draft Gears

Subjects include modifications to standard and tightlock couplers, design of yokes, testing and classification of draft gears

Tightlock Couplers

Improved type locklift assemblies, designated as H-15A and H-16A for Standard H. Tightlock couplers, and T-15A and T-16A for the Type T Modified Tightlock couplers, single and double operation, respectively, have been furnished in new couplers and for repairs to existing couplers since about a year ago to provide the greatest possible protection against undesired train partings. In August 1947 the Union Pacific applied these improved type locklift assemblies in the standard H couplers on two "City of Los Angeles" trains, without the use of "S" hooks or other means to secure the couplers against accidental parting. While no formal report has yet been submitted by the U. P., it is understood that they have functioned satisfactorily to date.

The reported difficulty in coupling standard H. tightlock couplers with M.C.B. couplers has been solved. Laboratory studies, and service trials showed that the trouble could be corrected by a change in the contour of the pulling face of the M.C.B. knuckles. The standard coupler manufacturers have accordingly arranged to provide the required contour in M.C.B. knuckles furnished in the future.

(During the past year the committee, in collaboration with the Mechanical Committee of the Standard Coupler Manufacturers, prepared Circular No. 5147, entitled "Instructions Governing Maintenance and Reclamation of A.A.R. Tightlock Couplers." Copies of this circular were issued by the secretary to all voting and associate members and appeared as an appendix to the report. It was recommended that these instructions be adopted as recommended practice and be included in the manual.—Editor)

The design of a standard flexible carrier was referred to the Mechanical Committee of the Standard Coupler Manufacturers, and it was considered impracticable to recommend a single design. In view of this, a specification covering the fundamental requirements for a satisfactory flexible carrier for tightlock couplers, was included as an appendix in this report and recommended for adoption as standard and included in the manual.

The Mechanical Committee of the Standard Coupler Manufacturers recommended two changes to the Standard H tightlock coupler Inspector's Contour Gauge No. 31727—an addition of 1/64 in. to the pulling face of the gauge to allow for wear, and a 3/32-in. increase in the plus allowance on the "G" (guard arm) movable point of the gauge to avoid excessive finishing. The changes were approved.

A.A.R. Standard E Coupler

As a result of satisfactory laboratory and service trials the Mechanical Committee of the Standard Coupler Manufacturers recommended adoption of an articulated rotor-lever assembly for the Type E coupler, both for single or double operation, together with necessary manufacturing gauges, as an alternate standard. The committee concurred in this recommendation, and standard catalogue numbers will be assigned to both the single and double assemblies when adopted.

Adoption was recommended of the articulated type of locklift lever designed to improve the anticreep protection in the Standard E coupler to prevent accidental unlocking under certain conditions of service where the present standard E-14 locklift lever is not fully effective. Investigations made to date indicate that these conditions are those wherein a longitudinal shock is imposed on the coupler combined with, or immedi-

ately followed by, a vertical shock tending to throw the lock upward and thus cause the anticreep to be ineffective. This may occur during a run-in of slack in combination with track or car conditions resulting in vertical bounce. These conditions may be aggravated by high-speed operation and the effect is that the outward swing of the operating rod causes rotation of the standard E-14 locklift assembly, in much the same manner as when intentionally operated, thus releasing the anticreep.

With the articulated rotor-lever arrangement this same outward swing of the operating rod acts also to swing the rotor lever forward instead of rotating to lockset, thus bringing an extension on the articulated lever to a position beneath the bottom front face of the coupler head. This action insures that the regular anticreep shoulder on the toggle remains in position to engage the anticreep lug in the coupler head in event the lock is thrown upward in the manner previously described.

The new coupler operating mechanism submitted by Standard Railway Equipment Manufacturing Company last year was at that time approved for trial application limited to 125 car sets. Certain improvements were subsequently made and the former restriction has been removed with unlimited application to cars in interchange service now permitted.

To eliminate the necessity for two styles of rod, one for Grade B and another for high-tensile steel couplers, the depth of the rotor lug in the two coupler designs will, in the future, be made the same, namely 5½ in. from the bottom of the shank to the bottom of the rotor lug.

The pressed-steel cap, with provision for welding, catalogue No. E2A was objected to by several railroads because they did not have welding in car yards where the caps are usually replaced, and the following amended recommendation was made and approved by the committee:

1.—That the new pressed-steel cap, catalog No. E2A, be continued as standard and be furnished in all new couplers on and after January 1, 1948.

2.—That the new pressed-steel cap, catalog No. E2A, be furnished on all repair orders on and after January 1, 1948, except when the former standard malleable iron cap, catalog No. E2, is specified on orders by indicating both material and catalog number.

To adapt the present E8A (single) and E9A (double) rotary locklift levers for use with No. 6 type coupler operating mechanism, changes were made in the design of the rotor eye of both levers, which will still permit use of the present standard one-piece operating rod but will provide the additional clearance necessary for the No. 6 rod. The new locklift assemblies incorporating these changes will be identified by catalog No. E14A, single, and E15A, double.

The required 4 in. minimum clearance dimension between the operating rod handle and the eye of the rod bracket in Fig. II, page C-34-D, Section C of the Manual, previously omitted, will be added as an editorial correction, as well as another change in Fig. II to indicate more clearly the required clearance between the inner end of the rod and the extension beneath the eye of the rotary locklift lever.

Type E Engine Couplers

As a permissible alternate practice, a proposed change in design of the coring in standard Type E engine coupler shanks, in order to reduce shrinkage frequently encountered

in the vicinity of the pin hole, was approved, and pages C-43, 44 and 45 in the manual will be revised accordingly.

Proposed Type F Interlocking Coupler

The development of the Type F interlocking coupler and attachments is nearing completion and laboratory tests, including complete physical tests and angling machine tests, have been conducted. Trial service applications have already been made to three Pennsylvania X40B cars and additional applications on several other roads are being arranged. Coupling and angling trials made on the Pennsylvania cars in Altoona Yards and on the hump were entirely satisfactory and no difficulty has been reported to date concerning the three cars in service.

Coupler Yokes

High-tensile steel design Y-30 and Y-40 yokes were recommended to be submitted to letter ballot for approval as alternate standards.

The Waugh Equipment Company has recently submitted for A.A.R. approval a design of yoke for use with twin-cushion draft gear and E swivel shank coupler in freight cars having a standard 24 $\frac{5}{8}$ -in. draft pocket. Comparative tests on this yoke in both Grade B and high-tensile steel indicated satisfactory strength in Grade B steel and this design was therefore unanimously approved and is recommended for adoption by letter ballot as an alternate standard.

The Committee on Specifications for Materials has recommended review of Specification M-118, covering coupler-knuckle pivot pins, and consider substitution of suitable physical properties in place of the drop test, or as an alternate therefor. It was unanimously agreed that retention of the drop test was desirable and therefore no change in the present specification is recommended.

Draft-Key Material

Three railroads have each agreed to equip 25 cars with draft keys in the as-forged condition on one end and with keys hardened by quenching and tempering on the other end. Records of performance, including relative wear on keys and associated parts are being kept.

Specification References for Material

Supplementing recommendations made last year, your committee recommends that the following additional material references be shown on drawings in the manual:

	A.A.R. Manual	Specification
	Page	No.
Coupler operating rods	C-34-D	M-122, Grade 1020
	C-34-E	as-forged
	C-76	
Striking casting or coupler carrier, C.S.	.....	M-201, Grade B
Striking casting or coupler carrier, welded construction, plate steel	.....	M-116, Grade B

Cracks in Coupler Side Walls

The committee noted conflicts in the condemning and reclamation rules covering cracks in the knuckle side walls of couplers, has reviewed the entire subject for both freight and passenger car couplers and recommended changes:

1.—Remove Fig. D from Interchange Rule 18 and substitute therefor Fig. 9 of Rule 23, and change Paragraph (1-a) of Rule 18 to conform with the dimensions of the new figure.

2.—Remove Fig. 5, including the stenciling requirement, from Page C-70-1947 of the manual and substitute therefor Fig. 9 of Rule 23, and change Paragraph 1 (e), Page C-66-1947, to conform.

3.—Change Passenger Car Rule 7, Paragraph (a), Interchange Rules, to read: (a) Such crack extends beyond the shaded area shown in Fig. 9 of Freight Car Rule 23. These cracks shall be measured on surface of coupler. Coupler bodies having cracks extending beyond these limits are condemned and must not be reclaimed by welding.

Coupler Vertical Spacing Limits

The following paragraphs were proposed to be incorporated in the Interchange Rules effective August 1, 1948.

New Paragraph (g) to Rule 20—With coupler placed at proper height and in alignment, as prescribed in paragraphs (e) and (f), the vertical spacing between top of coupler shank and bottom of striking casting must not exceed 1 $\frac{1}{2}$ in. If necessary to make adjustment, the opening should be made $\frac{7}{8}$ in. or as near as practical thereto.

New Paragraph 13 to Section (c) of Rule 3—Couplers: Effective January 1, 1951, the vertical spacing between top of coupler shank and bottom of striking casting must not exceed 1 $\frac{1}{2}$ in. From Owners.

As a further protection in the construction of new cars, it is recommended that reference to this spacing be included in the "Fundamentals of Design" and that a new Item 19 be inserted in both columns on page C-4 of the Manual of Standard and Recommended Practice, reading: Vertical spacing between top of coupler shank and bottom of striking casting (Maximum) $\frac{7}{8}$ in.

Supplemental Tests of Waugh Twin Cushion Type WM 4-6

The four gears which were applied to Armour stock cars ASEX 244 and ASEX 205 in 1940 and 1941, have not been removed for test since the last report.

The single gear which has been under constant compression in the Association laboratory since 1942 continues to be tested for capacity each month. To date neither the cushioning characteristics nor the capacity has changed appreciably. An additional specimen of this type of gear has been given a laboratory capacity test and then placed under constant compression in the open air. This gear is given protection from the weather only to the extent that a gear on a stored freight car would normally receive protection. It will not be disturbed for two years, at the end of which time the laboratory test will be repeated.

Tests of Gears after Service

Arrangements are being made to obtain two specimens of each type of certified draft gear which have been in service for ten years and ship them to the A.A.R. laboratory to determine the condition after this amount of service.

Classification of Draft Gears

The committee approved a decision to transfer to the obsolete class every gear which had a capacity of less than 15,000 ft. lb. when new, and a list of 16 draft gears was recommended to the Committee on Prices for Labor and Materials for transfer from the non-approved to the obsolete classification.

Measurement of Draft Gear Reaction

Experiments being made by the Edgewater Steel Company with the cooperation of Purdue University at the A.A.R. laboratory in an effort to find a better and simpler method of measuring draft-gear reaction than by double differentiation of chronograph curves have been completed and results placed in the hands of the sub-committee. These will be studied and decision will then be made as to what use, if any, should be made of the findings.

Certified Draft Gears

During the past year conditional certificates of approval have been granted to the following gears:

Miner A-22-XL, which, in due course, is intended to supersede Miner A-22-XB, Cylinder D-7940.

Hulson 202, which supersedes conditionally approved Hulson-Clark 150-B, which has been dropped from the list.

Waugh-Gould 420, which, in due course, is intended to supersede Waugh-Gould 403-A; it also supersedes conditionally approved Waugh-Gould 410, which has been dropped.

Waughmat Twin Cushion WM 4-6.

The members of the Committee on Couplers and Draft Gears are H. W. Faus (chairman), engineer motive power, N.Y.C.; C. K. Steins (vice-chairman), mechanical engineer, Pennsylvania; F. T. James, chief motive power, D. L. & W.; N. T. Olson, chief mechanical engineer, C. & N. W.; M. R. Buck, engineer car construction, A. T. & S. F.; B. Faughnan, assistant works manager, Angus Shops, C.P.R.; J. W. Hawthorne, superintendent motive power, C. of G.; I. N. Moseley, research and test engineer, N. & W.; H. N. Juel, engineer car maintenance, U.P.; A. B. Lawson, mechanical engineer, B. & O.

Discussion

In reply to a question about the specifications for flexible coupler carriers a committee member said that the specifications were purposely not narrowed down to the coil spring-

type because there had not been enough experience with the semi-elliptic spring type to rule it out.

(The report was accepted and the recommendations submitted to letter ballot.)

Report on Specifications for Materials

Revisions in many detail specifications—
Emergency rubber provisions withdrawn
—Firebox and boiler steel research

The Committee on Specifications for Materials recommends these changes and revisions of specifications:

1—Specifications M-101—Axles, Carbon Steel for Cars and Locomotive Tenders. With the concurrence of the Committee on Car Construction, it is recommended that the following new Section 23(c) (present Section 23c to be redesignated 23d) be added to these specifications upon adoption by letter ballot of the member roads: (c) For smooth forged axles, the maximum permissible throw, or runout at the center of the axle, after rough turning of journals and wheel seats, shall be 1/4 in.

2—Specifications M-106—Tires, Steel, Locomotives and Cars.

Specifications M-124—Tires, Heat Treated Carbon Steel. These specifications have been revised to clarify the number of requirements with respect to cooling, location of tension test specimen, marking by class designation and stress relief as a supplementary requirement when specified. Drafts of these revised specifications are identified as Exhibits A and B (not included in this abstract of the committee's report) and it is recommended that they be submitted to letter ballot of the members for adoption.

3—Specifications M-110—Rivet Steel and Rivets. It is recommended these specifications be changed as follows and referred to letter ballot for approval: Sec. 3—Chemical Composition.—Delete the item reading: "Carbon, per cent 0.18 max.;" Sec. 6—Tensile properties.—Add to item "elongation" the phrase: "but need not exceed 30 per cent."

4—Specifications M-112—Steel Bars and Plates, Carbon for Railway Springs.

Specifications M-113—Springs, Steel, Elliptical.

Specifications M-114—Springs, Steel, Helical. On account of some requirements being at variance with standard commercial practices, these specifications have been rewritten and are submitted for letter ballot approval.

5—Specifications M-116—Steel, Structural, Shapes, Plates and Bars. It is recommended that these specifications be revised to eliminate all references to Bessemer steel and bring all requirements into agreement with other accepted specifications so that railway consumers will not be penalized for unduly restrictive requirements not necessary to their end product. These specifications are recommended for adoption by letter ballot.

6—Specifications M-117—Heavy and Light-Gauge Carbon-Steel Sheets and Strip Steel. For the past two years steel producers have filed objections to many of the requirements of M-117-45 and after numerous consultations with producers, these specifications have been rewritten and are submitted for letter ballot approval.

It is to be noted that all applicable tables have been included together with flat products classification information to assist in preparation of purchase specifications.

7—Specifications M-119—Galvanized Sheets. These specifications have been the source of considerable controversy as to the quality and grading of galvanized sheets and often make it necessary for purchasers to reach special agreements with their suppliers of galvanized sheet products. Many of these differences have been eliminated by a revised draft of these specifications which are submitted for letter ballot approval.

8—Specifications M-122—Hot Rolled Carbon-Steel Bars.

The present edition of M-122 has been subjected to numerous criticisms and many attempts made to obtain correlation with A.S.T.M. specifications for similar products and acceptance by producer interests. These specifications have been rewritten to simplify the procurement of hot-rolled carbon-steel bars.

9—Specifications M-126—Carbon-Steel Forgings. The following changes in these specifications have been considered by the Committee and are recommended for adoption by letter ballot: Table II.—Revised to commercial standards to supersede present Table II; Table III.—Physical Requirements. Revisions made to agree with A.S.T.M. A-236, Class E, which is a commercial standard and does not carry the extra charges now assessed against the present A.A.R. M-126, Class D (88,000 lb. per sq. in. tensile).

In order to reflect the changes recommended in the table, Sec. 1—Scope of these specifications revised to cover six classes of carbon-steel forgings as follows: Class A—Untreated. This class is mostly used for drop forgings and parts of minor importance, and those which are to be case hardened. Class B—Untreated. This class is used for a general group of miscellaneous ordinary forgings, where heat treatment is not deemed necessary; Class C—Annealed or normalized; Class D—Annealed; Class E—Normalized and tempered; Class F—Normalized and tempered; Class G—Quenched and tempered; Class H—Normalized quench and tempered. Classes E, F, G and H forgings are used in high-duty service on locomotives, cars and other equipment.

10—Specifications M-402—Malleable Iron Castings. Negotiations with the Malleable Founders' Society have resulted in complete agreement on the grade of malleable suitable for railway applications and revised specifications is recommended for adoption by letter ballot.

11—Specifications M-501—Journal Bearings, Lined. On account of the continued shortage and high price of tin, the limits for the tin content of journal bearing backs has been changed from a range of 5—7 to a range of 4.5—6.5 to avoid the purchase of new tin, as the latter range is fairly constant for all salvaged journal-bearing backs. Revised Section 3 of these specifications will read as follows and is recommended for letter ballot approval: 3. Composition of Back: lead, 15—24 per cent; tin, 4.05-6.50 per cent; zinc, max., 3.00 per cent; impurities, max., 1.00 per cent; copper, balance

12—Specifications M-503—Bearings, Bronze, for Locomotives.

To eliminate the 1943 Emergency modification of M-503-42, it is recommended as a letter ballot item that Sec. 3 (a) of the latter be revised to read as follows and, if approved, the designation be changed from M-503-42 to M-503-48 and emergency Specifications E-M-503-43 annulled: 3 (a) Chemical Composition:

	Phosphor bronze (per cent)	Hard bronze (per cent)	Medium bronze (per cent)	Soft bronze (per cent)
Tin	7—9	6—9	6—8	4—6
Lead	9—12	10—16	16—22	23—27
Zinc, max.	0.75	1.25	1.25	1.25
Nickel, max.	1.00	0.50		
Iron, max.	0.15	0.20		
Antimony, max.	0.75	0.75		
Phosphorus	0.20—0.50	0.05 max.		
Other elements, max.	0.50	0.35	0.75	0.75
Copper	Balance	Balance	Balance	Balance

15—*Specifications for Rubber Hoses*—M-601—Air-Brake and Train Air-Signal; M-603—Air, Gas and Oxygen, Wrapped and Braided; M-604—Cold Water, Wrapped and Braided; M-605—Steam and Hot Water; M-606—Tender Tank; M-608—Pneumatic Tool, Wrapped and Braided.

In the committee's 1947 report, it was recommended that air-brake hose gaskets be made of natural rubber and the emergency specifications withdrawn.

Similar action is now recommended to annul emergency specifications E-M-601-45, E-M-603-44, E-M-604-44, E-M-605-44 and E-M-606-44. New specifications M-601, M-603, M-604, M-605, M-606, and M-608, are recommended for adoption by letter ballot. It is to be noted that M-605—Steam and Hot Water Hose, has been corrected editorially and M-608—Pneumatic Hose, is a new specification to separate air hose for 125 lb. per sq. in. working pressure from the welding-gas hose which is designed for higher pressures.

The cooperative investigation mentioned in last year's report of your committee with respect to aging resistance of rubber compounds for airbrake hose, etc., was further progressed during the past year and the tests are being continued.

Firebox and Boiler Steels

As mentioned in last year's report, a research program has been undertaken under the general direction of the A.A.R. Mechanical Research Office, acting with the Subcommittee of the Specifications Committee and representatives of the American Iron and Steel Institute (A.I.S.I.) Technical Committee on Carbon-Steel Plates, to determine the effect of residual alloys on carbon firebox and boiler steels.

Two conferences have been held since this group was organized. It was brought out in the first conference, held on February 11, 1947, that a program had been started by the A.I.S.I. Technical Committee on Carbon Steel Plates to investigate the properties of a considerable number of run-of-the-mill specimens of boiler and firebox steels produced in the members' mills. This investigation was set up to include a complete chemical analysis of the steels tested, with particular reference to residual alloys, and physical tests to include investigation of the weldability and hot and cold flanging properties of the plates investigated. It was also decided to request member railroads to send samples of failed boiler and firebox plates to the Denver laboratory of the Denver & Rio Grande Western, for chemical and metallurgical investigation.

At the second conference, held on April 6, 1948, the A.I.S.I. representatives made available a preliminary report covering the chemical analysis and physical test on a group of 145 production-heat specimens representing ten plate manufacturers and consisting of rimmed, semi-killed, and killed types of carbon steels. In addition to the items covered in the specification requirements, check was made of copper, nickel, chromium, molybdenum, and tin for each of the 145 heats. The physical tests included tensile, Charpy impact weld hardness, and precipitation hardening tests through a range of temperatures. The result of the hot-working tests were incomplete, but the program is being continued.

A total of 31 failed specimens have been studied at the Denver laboratory. These studies cover samples submitted by seven roads representing boiler-plate failures, and six roads representing firebox-plate failures. The majority of the failed plates investigated were carbon steel, but specimens of 2 per cent nickel boiler plate and carbon-silicon and carbon-molybdenum firebox plates were included. The investigations conducted at the Denver laboratory included check for residual alloys and physical tests at room and elevated temperatures.

The studies of the effect of residual alloys on steels currently produced by the manufacturers and in failed plates submitted by member roads is being continued.

The members of the Committee on Specifications for materials are H. G. Miller (chairman), mechanical engineer, C.M.St.P.&P.; W. F. Collins (vice-chairman), engineer of tests, N.Y.C.; T. D. Sedwick, engineer of tests,

C.R.I.&P.; H. G. Burnham, engineer of tests, N.P.; H. P. Hass, director of tests and research, N.Y.N.H.&H.; L. B. Jones, engineer of tests, Pennsylvania; W. R. Hedeman, engineer of tests, B.&O.; E. B. Fields, engineer of tests, A.T.&S.F.; R. McBrien, engineer, standards and research, D.&R.G.W.; R. H. Beverly, engineer of tests, Southern; G. E. Baumgardner, assistant research engineer, N.&W.; P. H. Smith, engineer of tests, C.B.&Q.

(The report was accepted and the recommendations submitted to letter ballot.)

Safety Appliances

The committee has approved the following designs of metal running boards for box and other roofed cars (including type "LO" covered hopper cars), and for metal brake steps for all cars, for conformity with the A.A.R. Specifications as to width, clear opening, deflection under load and non-skid features:

Steel Running Boards

Apex Tri-Lok, Type A; Blaw-Knox Electroforged, Type 8 J-16; Champion; Irving Type AA Grating; Kerrigan Weldforged Grating, Type KCW; Morton Open Grip; U. S. Gypsum Expanded Metal, Type A.

Aluminum Running Boards

Apex Tri-Lok; Morton Open Grip.

Steel Running Boards for Tank Cars

Apex Tri-Lok, Type B; Blaw-Knox Electroforged, Type P-16; Kerrigan Weldforged Grating, Type KTC; U. S. Gypsum Expanded Metal, Type B.

With the concurrence of your committee, the Arbitration Committee is recommending in its report this year a revision of Note 1 to Par. (r-7) of Interchange Rule 3 to permit the use of lighter-section dome steps and dome platforms on tank cars complying with the specifications for metal running boards for box and other roofed cars, where supports are centered not to exceed 48 in.

A number of applications have been submitted covering dome steps and dome platforms where thickness of material used does not conform to A.A.R. approved type for either "Box Cars" (with supports centered not to exceed 4 ft.), or "Tank Cars" (with supports centered over 4 ft. but not more than 10 ft.), indicating a need for an intermediate type of metal running board where the length of the unsupported span is over 4 ft. but not more than 7 ft. In view of this, it is recommended, as a letter-ballot item, that last paragraph of Sec. 3 of A.A.R. Specifications for Running Boards Other Than Wood, etc., be modified as follows:

Proposed Form. Construction to be such as to permit sections of unsupported length up to 48 in. without exceeding $\frac{1}{4}$ in. deflection under a 200 lb. static load applied at the center of the section, or sections of unsupported length over 4 ft. but not more than 7 ft. without exceeding $\frac{1}{4}$ in. deflection under a 200 lb. static load applied at the center of the section, except that for tank-car running boards the construction to be such as to permit section, or sections of unsupported length up to 10 ft. without exceeding $\frac{1}{4}$ in. deflection under a 200-lb. static load applied at the center of the section.

Subject to approval of this proposition by letter ballot of the members, the Arbitration Committee is requested to make conforming revisions in Interchange Rule 3, in the 1949.

It is expected that road tests of the ABLC brake equipment will be conducted during the coming year under the direction of your committee in cooperation with the Committee on Brakes and Brake equipment.

The report was signed by R. G. Henley (chairman), general superintendent motive power, N. & W.; H. T. Cover, chief motive power, Pennsylvania; J. E. Goodwin, chief mechanical officer, C. & N.W.; F. K. Mitchell, general superintendent motive power and rolling stock, N.Y.C. System; J. M. Nicholson, assistant to vice-president, A.T. & S.F.; A. K. Galloway, general superintendent motive power and equipment, B. & O.

(The report was accepted.)

Interchange Rule Revisions

Recommendations for changes in freight and passenger car rules —Extension dates restricted

During the year Cases 1825 to 1828, inclusive, have been decided and copies forwarded to the members. A copy of these decisions is made part of this report.

The principal changes in this report are:

Modifications are recommended in Rule 2 to provide for the handling of cars equipped with roller-bearings at interchange points [and to eliminate unnecessary clerical work in cases of load adjustment where the car was originally loaded in accordance with A.A.R. Loading Rules. Changes in Rules 3, 9, 17 (interpretation), 84, 85 and 93 were made to cover interchange of roller-bearings.—Editor].

With the concurrence of the Committee on Couplers and Draft Gears and as announced in the 1947 annual report and in the current code, no extension beyond January 1, 1949, is recommended for the requirement in Rule 3 prohibiting acceptance from owners of cars equipped with couplers having 5-in. by 5-in. shanks.

No extension beyond January 1, 1949, is recommended for the requirement in Rule 3 prohibiting acceptance from owners of cars having truck side frames to which reinforcing plates or repair patches have been applied.

Extension of the effective dates from January 1, 1949, to January 1, 1950, were recommended for the following items:

Section (b), Paragraph (7)—Brake levers; metal badge plates.

Section (b), Paragraph (9)—Braking powers; braking ratio.

Section (c), Paragraph (11)—Couplers having 5-in. by 7-in. shanks.

Section (c), Paragraph (12)—Couplers, bottom rotary operated, not equipped with assembled riveted-type lock-lift lever and toggle.

Section (t), Paragraph (10)—Tank cars; metal placard holders.

Section (u), Paragraph (4)—Class E-3 cars not to be accepted from owner.

With the concurrence of the Committee on Lubrication of Cars and Locomotives, it is recommended that new Paragraph (j-3) be added to Rule 3 to make mandatory the use of A.A.R. 1947 Standard journal-box lids on all cars built new or rebuilt on and after January 1, 1950.

With the concurrence of the Safety Appliance and Car Construction Committees, it is recommended that Note 1 following Paragraph (r-7) of Rule 3 be modified to provide for the use of lighter section metal dome steps and dome platforms where supports are centered not to exceed 48 in.

With the concurrence of the Committee on Car Construction, it is recommended that Paragraph (t-3-d) of Rule 3 be modified to require normalizing of secondhand truck side frames of T or L section designs, or U or any other section design cast in 1926 or prior thereto, to determine if same are suitable for reclamation or application to other cars.

Elimination of present Paragraph (w-2) of Rule 3 is proposed and it is recommended that provisions thereof be consolidated with present Paragraph (w-3), relocated as new Paragraph (w-2), and modified to prohibit double-plate cast-iron wheels and all cast-iron wheels below nominal weight in interchange and also to prohibit any type of cast-iron wheel without weight cast thereon. Changes in Rules 70, 83 (to be eliminated), and 98 were recommended to bring their provisions in conformity with this change in Rule 3.

The brake-beam table under Rule 17 is revised to eliminate references to non-A.A.R. and former A.A.R. No. 1 brake beams, which are no longer acceptable in interchange.

Change in Rule 66 is proposed to reimburse the car owner for half the charge for the next journal-box repacking if account out-of-date, after a repairing line has failed to repack the boxes on cars with repacking date between nine and fourteen months old when wheel changes or other work has required removal of packing from four or more boxes.

Addition of new Rule 66-A is recommended, to provide for periodic lubrication of cars equipped with roller-bearings.

New last note is recommended for addition to Paragraph (B-1) of Rule 112, to provide method of settlement for destroyed container cars and metal containers.

Changes in Rules 112 and 120 were recommended to include steel side and end doors, and metal drop end gates in the items of serviceable material returnable to the car owner if he so elects.

Changes to reduce clerical work in administering the rules, to simplify billing; or to expedite handling bills for payment were recommended in Rules 5, 7 and 91.

Extensions of effective dates with respect to equipping all-steel and steel-underframe passenger cars with suitable receptacles for defect and joint-evidence cards, and covering the applications of brake-shoe spark shields to cars having wood parts exposed over the wheels from January 1, 1949, to January 1, 1950, are recommended in Passenger Car Rule 2.

New Paragraph (1-2) is recommended for addition to Passenger Car Rule 7, to provide for periodic lubrication of passenger cars equipped with roller-bearing units. Change in Rules 10 and 13 are recommended to conform. It is also recommended that this rule make handling lines responsible for failure of roller-bearing units, or combination roller-bearing and friction-bearing units due to overheating when stenciling on the car indicates that periodic lubrication is 15 or more days over date.

The committee does not feel that any of the modifications included in its report necessitate submission to letter ballot.

The details of the rule changes follow:

Rule 2

The committee recommends that second paragraph of this rule be modified, effective January 1, 1949, as follows:

Proposed Form: Empty cars offered in interchange must be accepted, providing they conform to the requirements of Rule 3 and are in safe condition for movement, the receiving road to be the judge.

However, empty cars equipped with journal roller bearings may be rejected if such units are in defective condition.

Reason: To provide for the handling of cars equipped with journal roller bearings at interchange points.

The committee recommends that Item 2 of Section (f) of this rule be modified, effective January 1, 1949, as follows:

Proposed Form: (f) Transfer authority will not be issued account of the following defects:

2. All truck defects on foreign cars, except defective metal bolsters or center plates cast integral therewith, defective truck sides and metal transoms, defective non-A.A.R. standard journal boxes where A.A.R. standard is not a proper substitute, and defective journal roller-bearing units. However, where loaded car is equipped with type of truck prohibited under Rule 3, transfer authority is proper.

Reason: To provide for the handling of cars equipped with journal roller bearings at interchange points.

The committee recommends that Paragraph (h) of this rule be modified, effective August 1, 1948, to read as follows:

(h) The car transfer check authorizing transfer or rearrangement of lading must be of the form shown on page 271. All information required by the reading of the form must be filled in, except in cases of load adjustment where the car was originally loaded in accordance with the A.A.R. Loading Rules, information as to "Date Loaded," "Name of Shipper," "Station Loaded," and "Originating Road" may be omitted.

Reason: To eliminate unnecessary clerical work.

Rule 3

The committee recommends that effective dates for various requirements in the present rule, as listed below, now set at January 1, 1949, be extended to January 1, 1950.

Section (b), Paragraph (7)—Brake levers: Metal badge plates.

Section (b), Paragraph (9)—Braking power: Braking ratio.

Section (c), Paragraph (11)—Couplers having 5-in. by 7-in. shanks.

Section (c), Paragraph (12)—Couplers, bottom rotary operated, not equipped with assembled riveted type lock lift lever and toggle.

Section (t), Paragraph (10)—Tank cars: Metal placard holders.

Section (u), Paragraph (4)—Class E-3 cars not to be accepted from owner.

Reason: The present situation justifies these extensions.

With the concurrence of the Committee on Couplers and Draft Gears and as announced in the 1947 Annual Report and current Code of Interchange Rules, the committee recommends that no extension beyond January 1, 1949, be granted in effective date of requirement prohibiting acceptance from owners of cars equipped with former Standard or Temporary Standard couplers having 5-in. by 5-in. shanks, Paragraph (c-10) of this rule.

Reason: This requirement has appeared in the rules since August 1, 1938, and it is felt sufficient time has elapsed to permit compliance. A check of member railroads last year developed the number of cars in service equipped with 5-in. by 5-in. couplers is negligible.

The committee recommends that no extension beyond January 1, 1949, be granted in effective date of requirement prohibiting acceptance from owners of cars equipped with cast-steel truck side frames to which repair patches or reinforcing plates have been applied, Paragraph (t-3-f) of this rule.

Reason: This requirement was placed in the rules as a safety measure on January 1, 1947, and it is felt no extension of the effective date is warranted.

The matter of extension in effective date for requirement in Paragraph (a-4) of this rule for AB brakes has been referred to the General Committee.

The Committee recommends that a new note be added following Section (j-1) of this rule, effective January 1, 1949, as follows:

(j) (1) Journal bearings, A.A.R. Standard or approved equivalent, required on all cars built new on or after January 1, 1920, and on all cars rebuilt on or after July 1, 1928. In interchange.

Note.—Cars equipped with journal roller bearings are acceptable in interchange.

Reason: To provide for the interchange of cars equipped with journal roller bearings.

The Committee recommends that new Paragraph (j-3) be added to this rule in the next supplement, to read as follows:

(j-3) Journal box lids, complying with A.A.R. Specifications for Journal Box lids as revised in 1947 and having A.A.R. certificate of approval, required on all cars built new or rebuilt on and after January 1, 1950. From owners.

Reason: In order to make mandatory the use of A.A.R. 1947 Standard journal box lids, as recommended by the Committee on Lubrication of Cars and Locomotives.

The Committee recommends that Note 1 following Paragraph (r-7) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: Note 1—Dome steps and dome platforms for tank cars are considered to be in the same category as running boards and must therefore comply with the above requirements. *Dome steps and dome platforms, with supports centered not to exceed 48 inches, shall be considered as meeting the above requirements if they comply with the specifications for metal running boards for box and other roofed cars. Where supports are centered exceeding 48 inches, dome steps and dome platforms must comply with the specifications for metal running boards for tank cars.*

Reason: The use of lighter section dome steps and dome platforms on tank cars should be permitted in cases where supports are centered not to exceed 48 inches. This recommendation has the concurrence of the Safety Appliance and Car Construction Committees.

The committee recommends that Paragraph (t-3-d) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (t) (3-d) To determine if second-hand

frames of "T" or "L" section designs, or "U" or any other section design cast in 1926 or prior thereto are suitable for reclamation or application to other cars, they must be *normalized as provided in Section A—General Regulations, Rule 23*, following which careful inspection must be made. When truck side frames are given this treatment and inspection, a record must be stamped by at least $\frac{3}{8}$ inch steel stencils on top of compression member at center of frame (on smoothed surface) to indicate railroad or private car line reporting marks, date (month and year), shop identification symbol and legend "N", to indicate *frame has been normalized*. Frames of "U" or (etc., no other change).

Reason: As recommended by the Committee on Car Construction, which has found present specified temperature of 750 deg. F. is too low to accomplish the results desired, and that the normalizing process will make it possible to find defects requiring attention (or that warrant scrapping of part) and that at the same time this process will improve the quality and restore original physical properties of the casting.

The committee recommends that present Paragraph (w-2) of this rule be eliminated and that present Paragraph (w-3) be modified and relocated as new Paragraph (w-2), effective August 1, 1948, as follows:

Proposed Form: (w-2) Wheels, double plate cast-iron, *also any type of cast-iron wheel below nominal weight or without weight cast thereon*, prohibited on all cars. In interchange.

Reason: It is felt cast-iron wheels of any type below nominal weight or without weight cast thereon, should be prohibited in interchange, as a safety measure, along with the double plate design.

The committee recommends that second note following Paragraph (w-3) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: Note.—Industrial or other cars not intended for interchange service, when moving on their own wheels, may be accepted in interchange in their initial movement from manufacturer to destination (or seaboard) without meeting the requirements of Paragraph (a-1-a) in so far as retaining valve and A.A.R. Standard triple valve are concerned, (b-2) for No. 2 brake beams, (b-7) for metal badge plates, (b-8) for bottom rod and brake beam safety supports, (c-1), (c-2) and (c-6) for couplers and coupler operating levers, (h-2), (h-3) and (h-4) for geared hand brakes, (r-7) for running boards, brake steps, dome steps and dome platforms other than wood, (s-3) for stenciling, (t-1), (t-2-a), (t-2-b) and (t-4) for trucks, and the Specifications for Tank Cars. To each side of such cars a card shall be attached by shippers, reading as follows: (etc.)

Reason: It is felt requirement for metal running boards, etc., may be waived for industrial or other non-interchange cars in initial movement from manufacturer.

Rule 5

The committee recommends that the first paragraph of this rule be modified in the next supplement to the interchange rules to read as follows:

Proposed Form: Rule 5. Defect cards must be of the form shown on page 272. They must be of cardboard, printed on both sides, and must be filled in on both sides with ink or black indelible pencil. The cards must plainly specify in full each item for which charges are authorized, indicating the location of defects, as provided for in Rule 14. *However, in cases where a joint inspection certificate is presented for additional defect card, as per Section (k) of Rule 4, the road responsible may endorse the certificate in lieu of issuing defect card. In such cases the certificate must be furnished in duplicate form.*

Reason: To expedite the handling of requests for additional defect cards by eliminating the time involved in copying items on additional defect card which already appear on the joint inspection certificate.

Rule 7

The committee recommends that the third and fifth paragraphs of Section (2) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: The number and size of bolts, and purpose for which they are used, must be shown upon original record,

except where item of repairs includes price of bolts. The weights need not be shown. Nuts, when chargeable, must be specified, except those used on bolts renewed, in which case an average of one nut per bolt will be assumed as used, regardless of whether double nuts are used.

Paint and nails must be shown on original record, except where item of repairs covers paint and nails. The quantity need not be shown in those cases where it can be properly determined by the billing clerks.

Reason: To eliminate unnecessary clerical work and to bring the rule in line with present practice followed by some roads.

Rule 9

The committee recommends that third item under this rule be modified, effective January 1, 1949, as follows:

Journal boxes, friction bearings periodic repacking, etc. (Separate billing repair card required. Brasses and wedges should be included with other repairs.)	Name of road and date of last previous repacking, "no date" or "date illegible." Work performed, per Rule 66. Purposes for which car was shopped, if repacked prior to expiration of 15 months.
--	---

Reason: To indicate that item covers journal boxes with friction type journal bearings.

The committee recommends that a new item be added to this rule, effective January 1, 1949, to read as follows:

Journal roller bearing units, periodic lubrication, etc. (Separate billing repair card required.)	Name of road and date of last previous lubrication No date, or date illegible. Work performed, per Rule 66-A. Number of boxes.
---	---

Reason: To provide billing requirements covering bills rendered for the lubrication of journal roller bearing units.

Rule 17

The committee recommends that brake beam substitution table under Section (e) of this rule be modified in the 1949 Code by the entire elimination of Item 1 and by eliminating the reference to non-A.A.R. and former A.A.R. No. 1 brake beams from Items 2, 4, 7 and 9.

(Note: Revised table not included in this abstract—EDITOR)

Reason: Cars equipped with non-A.A.R. or former A.A.R. No. 1 brake beams may not be accepted in interchange under Paragraph (b-2) of Rule 3.

The committee recommends that Paragraph (6) of Section (i) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (6) A.A.R. approved friction draft gears, as listed in table under Rule 101, may be substituted for defective *Waughmat Twin Cushion WM-4-6* draft gears as correct repairs. The defective gear removed shall be held and

(No other change)

Reason: Conditional Certificate of Approval has been issued for *Waughmat Twin Cushion WM-4-6* draft gear.

The committee recommends that new Interpretation (M-11) be added to this rule, effective January 1, 1949, to read as follows:

(M-11) Q.—Is the substitution of wheels and axles equipped with A.A.R. standard friction bearing units for wheels and axles equipped with roller bearing units correct repairs, in cases where it is feasible for such substitution to be made.

A.—Yes. Material removed shall be held and promptly reported to car owner for disposition. If car owner elects to have same returned, shipping instructions must be furnished within 30 days, freight charges collect, otherwise such parts (except serviceable wheels) may be treated as scrap. The same disposition of parts removed shall be followed when repairs are made in kind, whether the material applied is from handling line stock or obtained from car owner under Rule 122.

Reason: To provide for the substitution of wheels and axles with standard friction bearings in trucks having wheels and axles with roller bearing units.

Rule 66

The committee recommends that Paragraph (g-2) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (g) (2) When cars having wheels changed or other work performed which necessitates removal of packing from four or more boxes, regardless of responsibility, and repacking date is between nine months and fourteen months old, all boxes must be repacked in accordance with the requirements of this rule, stenciling changed and charge rendered versus car owner for one-half of allowance specified in Rule 101. If repairing line fails to repack all boxes and change stenciling per this requirement, car owner should be reimbursed 50% of charge made for next subsequent repacking if due to overdate.

Reason: To encourage the repacking of journal boxes when cars are on repair track for other work.

The committee recommends that new Rule 66-A be added to the Code, effective January 1, 1949, to read as follows:

Rule 66-A. (a) Journal roller bearings which have not received periodic lubrication attention within one year as indicated by the stenciling on the car must be checked and lubricated. Cars will be considered as due for periodic lubrication after the expiration of 11 months, or as provided in Paragraph (c).

(b) This work may be performed on shop tracks or in transportation yards, preferably during the months of March to October, inclusive.

(c) On and after September 1st of each year, cars on shop track for other work should have, and cars in transportation yards may have, the lubrication checked and car so stenciled, when previous date indicates that car would be due for this attention during the following months of November to February, inclusive.

(d) Filling plug must be removed from all oil lubricated boxes, oil level checked and oil restored to maximum level, after which filling plug must be properly replaced. Grease cavities on grease packed bearings must be filled to capacity through grease fittings with pressure gun. Drain plugs must be checked to see that they are in place and securely wired. These requirements must also be closely followed for the boxes involved when wheels and axles, journal boxes, or roller bearings are applied.

(e) The place, month, day and year of lubrication check and the railroad or private line reporting marks with the symbol "Lub" must be stenciled on car body near the body bolster at diagonal corners with not less than 1-in. figures and letters. This provision applies also to new cars.

(f) No change shall be made in the stenciling unless lubrication check has been made on all boxes and the work in all detail has been performed.

(g) If car bears no stenciling showing date of previous lubrication check, or if date is illegible, all boxes must be checked and lubricated in accordance with paragraph (d).

(h) No charge shall be made for lubrication unless all boxes have been checked and the work in all detail performed.

(i) Work performed in accordance with the foregoing may be charged to car owner, per Rule 101, except as otherwise provided.

(j) The grade of lubricant used in journal roller bearing boxes must comply with A.A.R. Specifications For Grease and A.A.R. Specifications for Oil.

(k) Journal roller bearing boxes must be given external inspection currently for detection of overheating, cracks, leakage, or any other defects.

*(Specification references to be added later when developed by the Lubrication Committee.)

Owners
Respon-
sible

Reason: To provide for the periodic lubrication of cars equipped with journal roller bearing units.

Rule 70

The committee recommends that Paragraph (c-1) of this rule be eliminated, effective August 1, 1948.

Reason: Modification of Paragraph (w-2) of Rule 3 prohibiting double plate cast-iron wheels in interchange.

The committee recommends that Paragraph (f) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (f) In case of handling line responsibility for change of wheels and substitution is made as provided in Paragraphs (d-1), (d-2) or (e), charge for *multiple-wear*, 1-W, or 1-WT, wrought-steel wheels must not exceed second-hand value of wheels standard to car, except when betterments are applied to a car stenciled "NEW STD" as outlined in fourth paragraph of Rule 16.

Reason: To provide a more equitable basis for charges in connection with wheel substitutions.

Rule 83

The committee recommends that this rule be eliminated, effective August 1, 1948.

Reason: Modification of Paragraph (w-2) of Rule 3 prohibiting such wheels on cars in interchange.

Rule 84

The committee recommends that this rule be modified, effective January 1, 1949, as follows:

Proposed Form: (Delivering Company Responsible)—Journal cut, or requiring reconditioning, due to heating, on *friction bearing units*; axles bent, or axles damaged as provided in Rule 32. (See Rule 85 for journal roller bearing units.)

Reason: To indicate that responsibility is intended only for cut or damaged journals which have the friction type bearings.

Rule 85

The committee recommends that new second paragraph bracketed "Owners Responsible" be added to this rule, effective January 1, 1949, to read as follows:

Failure of journal roller bearing units due to defects or overheating, except overheating when stenciling on car indicates periodic lubrication date is more than 12 months old, no date on car, or date illegible.

Reason: To provide responsibility for failure of journal roller bearing units.

Rule 86

The committee recommends that table covering standard axles and first and second notes following on page 172 of the current Code be modified, effective August 1, 1948, as recommended by the Committee on Car Construction and the Committee on Wheels and approved by letter ballot.

(Note: New table showing dimensions and limits of wear on new standard axles not included in this abstract—EDITOR)

Rule 91

The committee recommends that Sections (b) and (c) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (b) No bills should be returned for correction on account of incorrect car numbers or initials, but should be passed for payment at once and alleged errors brought to the attention of the company rendering same, within six (6) months from date bill is passed for payment, *but in no case exceeding seven (7) months after first receipt of bill.*

The billing company shall furnish correct car reference, or shall issue within 90 days countercharge authority, as per form shown on page 277. If it is alleged car was not on repairing road on date claimed, the car owner must show location of car on such date.

(c) No bills shall be returned for correction on account of other error or questionable charges unless the net amount involved is at least \$1.00 and exceeds 10 per cent of the total amount of bill, but shall be passed for payment at once and the alleged error brought to the attention of the billing company within six (6) months from date bill is passed for payment,

but in no case exceeding seven (7) months after first receipt of bill. The billing road must furnish proper explanation or shall issue within 90 days countercharge authority on form shown on page 277.

Reason: To expedite the handling and payment of car repair bills.

Rule 93

The committee recommends that third item in this rule covering separate statements be modified, effective January 1, 1949, to read as follows:

Separate statements to be made:

Third. For periodic repacking of *friction bearing* type journal boxes, etc., and *lubricating journal roller bearing units*, as per Rules 66 and 66-A.

Reason: To provide billing regulations for charges covering the lubrication of journal roller bearing units.

Rule 98

The committee recommends that Paragraph (c-2) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (c-2) Double plate cast-iron wheels, or any design of cast-iron wheel without weight cast thereon or below nominal weight, shall, when removed from service, regardless of condition, be credited as scrap at expense of car owner in all cases, except as provided in Rule 68, and in cases where one wheel is broken in derailment it will be credited as scrap at expense of handling line and the mate wheel, if undamaged, will be credited as scrap at expense of car owner. In such case notation "D.P." or "No Cast Weight" or "Below Nominal Weight" shall be shown on billing repair card to justify scrap credit.

Reason: To harmonize with change in Rule 3 and elimination of Rule 83.

The committee recommends that Paragraph (c-4) of this rule be modified, effective August 1, 1948, as follows:

Proposed Form: (4) If, on basis of Rule 70 (c) improper substitution of cast-iron wheels is made, either account owner's or delivering company's defects, (etc.—no other change.)

Reason: Account change in Rule 70.

The committee recommends that second note following Interpretation No. 4 to this rule be modified, effective August 1, 1948, as follows:

Proposed Form: Note—Secondhand single plate non-bracketed cast-iron wheels, substituted under any of the above conditions, shall be charged at scrap value.

Reason: Account modification of Paragraph (w-2) of Rule 3 prohibiting double plate cast-iron wheels in interchange.

Rule 101

The committee recommends that table on page 211 of this rule be modified to include A.A.R. Alternate Standard long travel truck springs, in the next supplement.

Reason: To provide average weights for long travel truck springs.

Rule 104

The committee recommends that new Item 7-A be added to Section (1) of this rule, effective August 1, 1948, as follows:

(1) The following items of material, when applied in repairs to owner's defects or on authority of defect card, must, if secondhand, be charged at 50 per cent of gross value new, less credit for part removed.

7-A Coupler yoke back filler.

Rule 112

The committee recommends that present last note in table under Paragraph (B-1) of this rule (as quoted below) be eliminated, effective August 1, 1948.

"Note.—TMN type box cars equipped with Flexitanks for transporting non-regulatory petroleum products, shall be settled for on per pound box car basis for the car proper, plus allowance for the Flexitank installation (including pipe and bulkheads) on reproduction cost basis depreciated from date of installation at 5 per cent per month on straight line basis."

Reason: Account this type of car no longer in service.

The committee recommends that new last note be added to table under Paragraph (B-1) of this rule, effective August 1, 1948, to read as follows:

Note.—Metal containers of container cars shall be settled for on basis of reproduction cost, depreciation from date built new complete at an annual depreciation rate of 7 per cent, not to exceed maximum depreciation of 90 per cent: Remainder of car to be settled for on per pound basis applicable to cars of its type and class at regular depreciation rates and limits."

Reason: To provide method of settlement for destroyed container cars and metal containers.

The committee recommends that the following additional items be added to Section (J) of this rule (Return of Serviceable Material to Car Owner), effective August 1, 1948: Steel side and end doors; Metal drop end gates.

Reason: It is felt car owner is entitled to the return of these items if he so elects.

Rule 120

The committee recommends that the following additional items be added to the second paragraph of Section (g) of this rule (Return of Serviceable Material to Car Owner), effective August 1, 1948: Steel side and end doors; metal drop end gates.

Reason: It is felt car owner is entitled to the return of these items if he so elects.

Passenger Rule 2

The committee recommends that the effective date of Paragraph (e) of this rule, with respect to equipping all-steel or steel-underframe cars with cardboards or suitable receptacles for accommodation of defect and joint evidence cards, and effective date of Paragraph (f) covering the application of brake shoe spark shields to passenger train cars having underneath exposed wood parts over wheels, both requirements now being set at January 1, 1949, be extended to January 1, 1950.

Reason: The present situation justifies these extensions.

Passenger Rule 7

The committee recommends that Paragraph (e-4) of this rule be modified, effective January 1, 1949, as follows:

Owners defects are as follows:

(4) Failure of roller bearing units, or combination roller bearing and friction bearing units, due to defects or overheating, *except overheating when stenciling on car indicates periodic lubrication is 15 or more days overdue.*

Reason: It is considered equitable to establish handling line responsibility for failures where handling line allows lubrication date on cars with journal roller bearings to become 15 or more days overdue.

The committee recommends that new Paragraph (1-2) be added to Section (1) of this rule, present (1) to be designated as (1-1), effective January 1, 1949, to read as follows:

(1-2) *Journal roller bearing which have not received periodic lubrication attention within 30 days as indicated by*

the stenciling, must be checked and lubricated. This work to be performed in detail as outlined in Freight Car Rule 66-A, except for time periods, Sections (a), (b) and (c), and location of stenciling, per Section (e). The stenciling, as per Section (e) of Rule 66-A, to be located on the truck frame above Nos. 1 and 8 pedestals on four-wheel trucks, and above Nos. 1 and 12 pedestals on six-wheel trucks. Separate billing repair cards shall be furnished showing number of boxes, name of road, date of previous lubrication check, or no date, or date illegible, and charge rendered versus car owner in accordance with Item 21-A of Rule 22.

Reason: To provide for the periodic lubrication of cars equipped with journal roller bearing units.

The committee recommends that tables in this rule covering 1940-Design Passenger Car Axle and the Tubular Car Axle (including both notes following the latter) be modified, effective August 1, 1948, as recommended by the Committee on Car Construction and the Committee on Wheels and approved by letter ballot.

Note: Tables showing dimensions and limits of wear of new solid and tubular passenger car axles, were in the original report—EDITOR.

Passenger Rule 10

The committee recommends that Item 2 of this rule be modified, effective January 1, 1949, as follows:

Interchange service expense items to be assumed by handling line are as follows:

2. Lubrication, except periodic repacking or *periodic lubrication of journal roller bearing units.*

Reason: To clarify the intent with respect to periodic lubrication of journal roller bearing units.

Passenger Rule 13

The committee recommends that sixth item under Section (b) of this rule be modified, effective January 1, 1949, as follows:

(b) No labor or material shall be charged for the following items:

Proposed Form: Lubrication, except cars in line service, or periodic repacking, or *periodic lubrication of journal roller bearing units*, as referred to in Section (1) of Rule 7.

Reason: To clarify the intent with respect to periodic lubrication of journal roller bearing units.

The members of the Committee on Arbitration are J. P. Morris (chairman), general mechanical assistant, A. T. & S. F.; J. A. Deppe (vice-chairman), superintendent car department, C. M. St.P. & P.; W. N. Messimer, superintendent of equipment, Merchants Despatch Transportation Corporation; L. Richardson, mechanical consultant to vice-president operations, B. & M.; G. E. McCoy, assistant chief of car equipment, C.N.; C. I. Clugh, assistant chief of motive power (car), Pennsylvania; J. J. Root, vice-president, Union Tank Car Company; M. F. Covert, general superintendent equipment, General American Transportation Corporation.

(The report was accepted.)

Report on Prices for Labor and Material

Price revised and obsolete items removed— Modifications proposed to simplify billing

In considering the subject of simplification of the pricing rules, in an effort to effect further economies in the cost of car repair billing, your committee has given consideration to the adoption of an improved arrangement of such rules as well as the elimination of obsolete items and consolidations of items to eliminate extremely fine divisions. The modifications proposed herein will eliminate a net of 122 items from the rules and will simplify the pricing, and it is felt will result in a decrease in correspondence regarding billing transactions. The recommendations submitted are explained in detail under the individual rules.

The proposed modifications have been checked and ap-

proved by the Arbitration Committee and, if adopted, it is recommended same be made effective on January 1, 1949.

It is the intent of the committee to investigate labor and material costs again in October and, if sufficient change develops, necessary revisions will be made and inserted in the rules effective January 1, 1949.

Rule 101

All miscellaneous material prices in Rule 101 were rechecked as of March 1, 1948, quotations submitted by the purchasing agents of the ten selected railroads, representing 39 per cent of total freight-car ownership in the United States

and Canada, showing an upward trend in material markets as indicated by detail recommendations for revisions shown under this rule.

New note is added following Item 73 and also following Item 84, to provide an arbitrary charge of 55 per cent of the new price in all cases, where the emergency portion or service portion of the AB valve is renewed on authority of defect card because of damage by fire.

The note preceding the table covering extra-heavy pipe fittings (Items 99 to 99-H) is modified, to indicate that pipe nipples need not carry the markings prescribed therein; also eliminating the size marking requirement of the note for all fittings.

Item 107-C is modified to indicate that the geared hand brake approved under 1942 specifications is intended. A new note is added following this item to provide for charges where substitutions of approved and non-approved types of geared hand brakes are involved.

Item 127-B is modified, to include size, kind of material, and to indicate that the swivel yoke specified is an A.A.R. alternate standard.

Item 133 is modified, to indicate that a No. E-2 malleable-iron cap for the coupler top-lock-lift hole is intended. New Item 133-A is added, to provide charge for No. E-2-A pressed-steel cap for the coupler top-lock-lift hole.

Items 145, 146, 149, 150, 151, 154, 154-A, 156, 157 and 157-A are eliminated because infrequently used or obsolete, the committee being unable to obtain current costs on these types of doors. To provide for the few cases where such details might be renewed, a new note is added following Item 156-C.

First paragraph of note on page 202 covering friction draft gears is modified, eliminating Westinghouse D-2, D-3, and D-4 draft gears therefrom.

Note 3 following Item 250-K is modified, to indicate conditional approval for Waughmat Twin Cushion Type WM-4-6 draft gear for unlimited application to cars in interchange.

Draft gears listed under Items 251, 251-D, 251-E, 251-G, 253, 253-F, 254-C, 256, 257, 257-C and 257-F of Section II (Non-approved Friction Draft Gears) are transferred to Section III (Obsolete Types of Friction Draft Gears), and prices changed accordingly, as recommended by the Committee on Couplers and Draft Gears.

The next to the last item in the table of weights of coupler yokes on page 212 is modified.

A new table is added to this rule covering Weights of Horizontal Draft Gear Keys.

Rule 107

Item 28 is modified and a new note added following Item 60, to clarify the intent.

A new note is added following Item 143, to provide a revised method for charging for running-board end cleat or extension block applied separately.

A new Item 153-A is added, to provide a combination charge for spring plank and other details applied at the same time to trucks having other than unit-type cast-steel sides.

Items 254 and 255 are modified to indicate that unit-type truck sides only are intended, and a new note is added follow-

ing each of these Items to provide a combination charge for R. & R. or R. of journal-box bolts where other than cast-steel truck sides are involved.

A new note is added following Item 256 to provide a charge for application of truck springs, etc., on an empty-car basis, where the same end of the car is jacked for other repairs.

Note following Item 278 is modified to clarify the intent.

Items 281 and 281-A are modified, to clarify the intent as to the dividing point between charges at low and high rates.

Table heading on page 240 is modified, to indicate that truck combination labor charges in the items following apply to trucks with unit-type truck sides only.

The note under Item 327 is modified to clarify the intent.

Rule 111

No modifications are recommended in this rule.

Rule 112

Recommendations are made in this rule respecting reproduction pound prices of new freight cars of all classes, in order that the Supplement of August 1, 1948, may reflect 1947 costs in lieu of figures shown in the present Code. New prices recommended are based on the cost of 37,712 freight cars constructed during the year 1947.

Passenger Car Rule 21

No modifications other than changes in allowances are recommended in this rule.

Passenger Car Rule 22

Note 1 following Item 41-A is modified, to indicate the metallic connector coupler head should be excluded when computing the total charge for repairing the connector on a car. Note 2 following Item 41-A is modified, to include Franklin metallic connectors. A new fourth note is added to this rule, to clarify the intent as to charge where both terminal heating and precooling operations are performed on the same car in line service at originating terminal for the same departure.

Other Matters

Time studies are being made by a special subcommittee covering periodic attention to AB and AB-1-B air-brake equipment, Items 15 and 15-A of Rule 111. At the same time, studies are being made covering periodic attention to other types of air brakes for which average allowances are not now provided. When studies are completed and the results justify modification of existing allowances or the addition of new items, such changes or additions will be made.

The members of the Committee on Prices for Labor and Materials are T. J. Boring (chairman), general foreman, M.C.B. Clearing House, Penn.; P. F. Spangler (vice-chairman), assistant superintendent motive power, St. L.-S. F.; J. D. Rezner, superintendent car department, C. B. & Q.; L. B. George, assistant chief motive power and rolling stock, Can. Pac.; G. J. Flanagan, general car inspector, N.Y.C.; J. J. Root, Jr., vice-president, Union Tank Car Company; A. H. Gaebler, superintendent car department, General American Transportation Corporation; G. R. Andersen, superintendent car department, C. & N. W.

(The report was accepted.)

Investigations of Hot-Box Alarm Devices

Committee does not recommend any alarm for general use because of unsatisfactory operation of the devices under its observation

The first progress report compiled by the committee and issued under date of April, 1947, giving a complete review of the work of the committee to that date, has been approved for distribution to the members (on request) at a cost of \$1.00. The report is also available to non-members at a cost of \$2.00.

During the past year a number of additional devices have

been submitted to the committee from individuals and manufacturers, but there has been insufficient additional information developed since the 1947 annual report to warrant issuing a second progress report.

Tests of Four Devices

The principal activity of the committee during the past

year was to continue observations of the four devices approved for road service tests, and installed in passenger cars equipped with solid bearings operating in regular service on the Pennsylvania. The four devices being observed in road service are: (1) Minneapolis-Honeywell Regulator Company's hot-journal alarm; (2) Union Switch & Signal Co.'s hot-journal detector; (3) Pennsylvania's cartridge type hot-box alarm, and (4) Magnus Metal Corporation's Twin-Plex smoke-and-odor bomb.

A tabulation showing the results of the road service tests of these devices as of March 1, 1947, was published in the 1947 annual report. The records for the total period of service as of March 31, 1948, show that the Minneapolis-Honeywell alarm in 27 months of service gave 11 true indications, 16 false alarms, two possible false indications, two failures and was found with 13 equipment defects, or conditions which might have prevented the device from operating properly.

The Union Switch & Signal alarm device in 28 months produced 4 true indications, 13 false alarms, one failure, and 11 defects. The Pennsylvania alarm in 22 months gave 8 true indications, 13 false alarms, one possible false indication, had one failure and 15 defects. The Magnus Twin-Plex alarm in 16 months gave no true indications, one false alarm, had one failure and one defect. A summary of the observations made of these four devices on the Pennsylvania from March 1, 1947, to March 31, 1948, were included in the report as Appendix A.

Twin-Plex Alarm

The committee has been advised that the Twin-Plex (smoke-and-odor bomb) alarms are now in service on more than 100,000 bearings on 60 railroads, of which approximately 35,000 are installed in both plain and roller-bearing journals operating on the New York Central. A record of 16 cases of hot bearings detected by the Twin-Plex alarms on the New York Central System during the year between March 1, 1947, and March 1, 1948, as reported to the committee by the equipment engineering department of the railroad under date of March 11, 1948, were included in the report as Appendix B. In transmitting this record to the committee it was stated that there may have been other cases of alarms functioning, or failure to function that were not reported, but that the investigation of the 16 cases which were reported indicated the facts were as they are shown in the appendix.

Conclusions

No particularly promising alarm-device ideas have been brought to the committee's attention, or indicated by the relatively few devices subjected to laboratory investigation at Altoona during the past year. The devices still being submitted are for the most part modifications of suggestions from previous submitters as classified in the committee's 1947 annual report.

The continuance of numerous false alarms and alarm equipment failures makes for an overall unsatisfactory and unreliable operation of the alarm devices under observation, and the committee, therefore, cannot yet recommend any hot-box alarm for general use.

The members of the Committee on Development of Hot Box Alarm Devices are J. R. Jackson (chairman), mechanical engineer, Mechanical Division, A.A.R.; L. B. Jones, engineer of tests, Pennsylvania; H. L. Holland, assistant mechanical engineer, B. & O.; J. Stair, Jr., electrical engineer, Pennsylvania; J. W. Hergenhan, assistant engineer, test department, N.Y.C.

Discussion

Several members submitted written discussions and took cognizance of the fact that the conclusion of the committee's findings was to the effect that no promising alarm devices have been brought to the committee's attention or indicated by the devices subjected to laboratory investigation and that "The continuance of numerous false alarms and alarm equipment failures makes for an overall unsatisfactory and unreliable operation of the alarm devices under observation and

the committee therefore cannot yet recommend any hot box alarm for general use." One member made the comment that experience on his road had indicated that many of the so-called failures to take advantage of the functioning of alarm devices were actually failures of employees to be guided by the indications. He also questioned the trend toward the use of numerous devices indicating faulty functioning of car and locomotive equipment parts with the observation that too great reliance on such indications did not contribute to maximum efficiency on the part of operating crews. Another member citing specific example of experience with these devices said:

"For example, please compare the facts reported with respect to Device No. 3 under date of January 29, 1948, on Page 10 with those reported with respect to Device No. 4 under date of February 12, 1948, on Page 11:

"In both cases the hot bearing was first discovered by car inspectors after train arrived at terminal and in both cases the bearing was just hot enough so that lining metal was wiped. Also in each case there was evidence that alarm had functioned. In neither case, however, had the train crew noted the alarm and yet Device No. 3 is credited with a true indication whereas Device No. 4 is charged with a failure. It is explained that Device No. 3 is credited with a true indication because the failure of the train crew to notice the indication which it must have received is properly chargeable as a man failure and not as an alarm failure. No exception is taken to this; in fact one might go further and assert that even the man failure was excusable. Based upon our experience we doubt if any type of hot box alarm will prove to be effective unless a sufficient number of cars are equipped to justify the full instruction of all train crews and all others concerned. The only point we make here is that if Device No. 3 was properly credited with a true indication, Device No. 4 under like circumstances should be credited with a true indication and not with a failure.

"Also, it is noted that in the tabular summary on Page 2, Devices No. 4, the Twinplex Alarm, is charged with a false alarm. In the chronological record of this device, however, we can find no false alarm listed.

"These two seeming discrepancies appear important to us because if Device No. 4 is credited with a true indication instead of a failure on February 12, 1948, and if no false alarm actually occurred with this device, then the summary for the Twinplex Alarm on Page 2 should read:

True Indications	1
False Alarms	0
Possible False Indications	0
Failures	0
Equipment Defects	1

"I want to emphasize that there is no thought whatever that the committee was influenced by any bias for or against any particular device. A glance at the personnel of the committee is enough to refute any such suggestion. Besides, if there had been any bias against Device No. 4, the twinplex alarm, the committee would not have taken the trouble to include in this report so much favorable evidence of the performance of this device on the New York Central, and called attention to the fact that more than 100,000 bearings on 60 railroads have been equipped with it."

Another member, discussing some of the difficulties that have been encountered with hot box alarms, said in part: "In going over the defects listed by the committee, it appears to me that there is an unusual amount of wire and insulation trouble. This, I believe, should give the manufacturers a lead in the developing of a special wire and insulation that will withstand the excessive flexing this wire has to take in operation. To my mind, this wire should be of a heavier gauge than the present wire and should contain considerably more strands per conductor.

"Some consideration should be given to bringing out the leads from the cartridge. At the present time they make a 90 deg. bend at the cable grip on the end of the cartridge. It is at this bend where all the flexing occurs and the point where the wire breaks. An angle fitting could be placed on the end of the cartridge which would bring the wire out in

the vertical position, doing away with the 90 deg. bend and allowing the flexing of the wire in its entire length.

"For the past three months there has been a car operating in one of the coast trains equipped with a hot box alarm system of a manufacture not mentioned by the committee. This system has given false alarms due to wire trouble, and quite often comes into Chicago with the system switched out for no apparent reason. This system has a ground relay that switches on a light whenever there is a ground on the alarm system or on the car wiring, and we are inclined to believe that someone is switching this system off whenever the ground light is burning, but to date we have been unable to prove this. We are going to recommend that this ground light and relay be disconnected as it has no value in the operation.

"The control panel of this system is so arranged that whenever a hot box journal alarm comes in, be it true or false, it lights a red light, starts a buzzer going, and through a timer motor and switch operates a solenoid valve in the air signal line which gives a direct signal to the engineer in the cab of the locomotive. This signal is coded to the desires of the railroad. The code used in this air signal line should not conflict with any signals now used in train operation.

"On the control panel there are also eight momentary contact switches, one for each journal or element. These switches are used to determine which element or journal is in trouble. Switches are operated one at a time and the switch that puts the red light out indicates the element or journal in trouble."

(The report was accepted.)

Joint Report on Sanitation

The Sanitation Research Project has been continued since the last report was made, under the direction of Dr. Abel Wolman, consulting engineer and professor of sanitary engineering—John Hopkins University.

Investigation into the use of passenger car toilet facilities and the nature and quantities of toilet wastes, as covered in Technical Report No. 3, has been supplemented during the past year by similar studies on transcontinental trains, including coaches, room type and open section sleeping cars.

These studies were conducted on trains operating be-

tween Chicago and Portland, Chicago and Los Angeles, Washington, D. C., and Ft. Worth, Tex. Checks were also made of frequency of coach toilet use on short runs between Baltimore and Elkins, W. Virginia via Hagerstown and Cumberland. The results of these investigations are included in Technical Report No. 4 recently distributed to member roads.

During the past year service tests were made of a grinder type disposal unit attached to women's toilet of Pennsylvania Coach 3829 in regular operation between Washington and New York. This test covered a period of about five months during which the test unit functioned satisfactorily until the advent of freezing weather when difficulties were encountered due to the rotor sticking. This was corrected by installation of steam coils and insulation.

Concurrently, tests of a model treatment device in the Project Laboratory were continued. In view of the relatively limited use of toilet hoppers in branch line or other service where traffic is light, investigation is being made of various practical means for the retention of wastes, including (a) permanently installed metal containers which would be drained and cleaned in place, (b) removable metal containers or tanks which can be readily dismounted and replaced with clean and sterilized tanks and (c) disposable containers, preferably of combustible material.

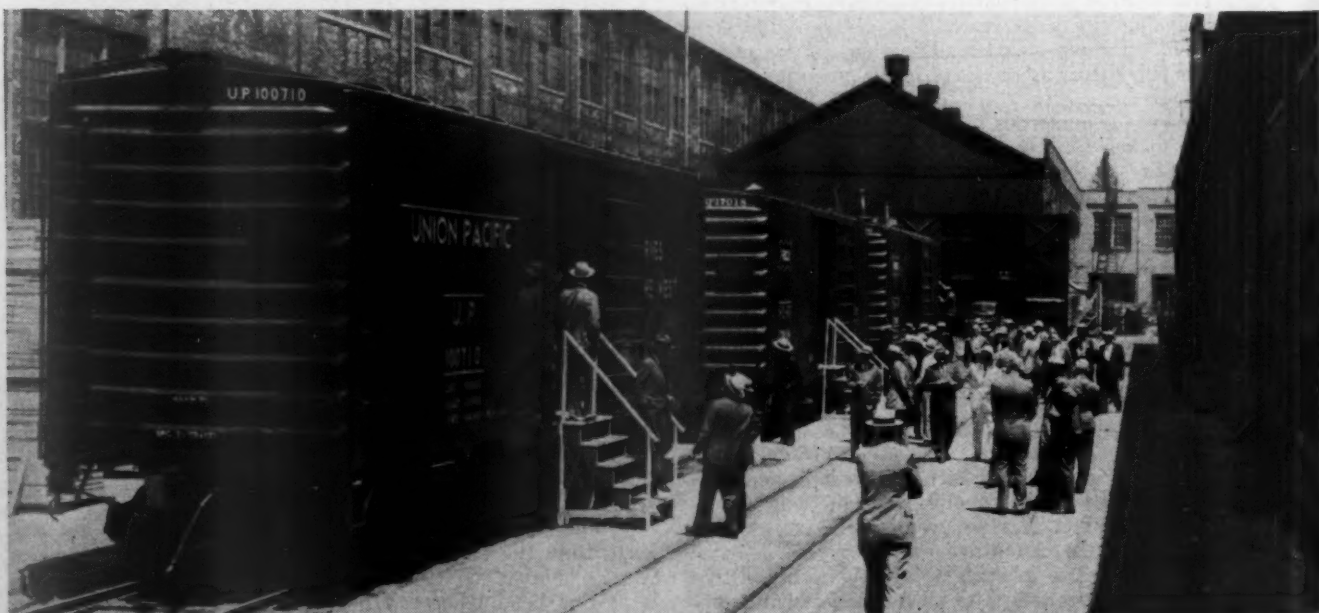
The committee intends to continue the development of the complete treatment device and retaining receptacles and special attention will be given to the collection and treatment of toilet wastes on multiple room cars, which presents many difficult problems.

In progressing this investigation, due consideration is being given to practical and financial aspects. The conditions under which cars would be equipped will be contingent upon the action of the Association of American Railroads and the requirements of the U. S. Public Health Service at the time final report and recommendations are submitted.

(The report was presented by Chairman E. P. Moses, engineer of rolling stock, N. Y. C., the Joint Committee on Railway Sanitation comprising three representatives each of the A. A. R. Mechanical Division, Engineering Division, Medical and Surgical Section, and of the U. S. Public Health Service.)

(The report was accepted.)

* * *



P-S-1 box cars being inspected at Pullman-Standard plant, Michigan City, Ind., by railroad men attending the annual meeting of the A.A.R. Mechanical and Purchases & Stores Divisions at Chicago, June 28 to 30, inclusive

EDITORIALS

Roy V. Wright

During his long career in the railroad field, Roy V. Wright saw many changes in motive power and rolling stock and many changes in operating and maintenance practices, all of which have tended to improve the reliability of railway operation. Mr. Wright's participation in this period was both as a railway man and as an editor.

As a railway man his career coincided with the early stages of two revolutionary developments affecting motive power and rolling stock. One was the advent of the all-steel freight car; the other, the replacement of line shafting and belt drives for railway shop machinery with individual motor drives. As a mechanical engineer during the first years of the century, on a railway which was an early purchaser of all-steel hopper cars, Mr. Wright participated actively in many aspects of the development of all-steel rolling stock. It was during this same part of his career that he also had an active part in the electrification of the locomotive repair shops of the railroad by which he was employed.

Mr. Wright's experience with these two developments influenced his early work as an editor. The then American Engineer and Railroad Journal, under his editorial direction, carried much valuable material on steel freight-car design during a period in which engineers in the employment of railways were in great need of education in this subject.

At the time Mr. Wright joined the staff of the American Engineer and Railroad Journal it was predominantly an equipment paper. Most of the space was devoted to descriptions of cars and locomotives and articles dealing with various aspects of their design. Mr. Wright was instrumental in adding to the paper a strong maintenance slant. He sought material descriptive of modern shop installations; he published articles on shop practice, and on new shop tools and equipment. The *Railway Mechanical Engineer* as it appears today, with its balanced program of articles on car and locomotive design and construction, and on various aspects of car and locomotive maintenance is the result of his influence during the early days of his editorship.

The subjects in which Mr. Wright's personal interest never flagged had to do, first, with personnel relations and, second, with production control and shop efficiency. Throughout his career as an editor, he was an advocate of apprentice training, including school as well as shop instruction, under enlightened supervision. Through Railroad Y.M.C.A. conferences, especially, he took an active part in improving personnel relations.

Subordinate, in his interest, only to personnel relations were problems of shop organization and efficiency. His early editorial days were passed in the era of efficiency engineering. He studied, reported, and discussed

the application of efficiency methods in railway shops throughout the period in which these methods were popular. He never lost active interest in all methods of coordinating the work of the various shop departments to expedite the output of repaired locomotives and cars.

Those who have read the account of Mr. Wright's career which appears elsewhere in this issue will understand that many fields in which he was actively interested are beyond the scope of this review. His interests in church, Y.M.C.A., profession, politics, education and citizenship, however, all suggest the same outstanding quality of his personality which was evident in his primary interests in the railroad field—he liked people.

The sense of personal loss of which his associates are keenly conscious precludes any attempt at an objective appraisal of the man by them. They saw something of his daily routine, however, and know that men now successfully established in many lines of activity all over America, and some outside of America, remember gratefully the advice and help he gave them at the outset of their careers. No young man who sought his advice was ever turned away.

What Electrical Men Are Doing

The two Electrical Sections of the Association of American Railroads will meet at the Hotel Sherman in Chicago on September 8, 9, and 10. The Railway Electric Supply Manufacturers Association will hold an exhibit in conjunction with the Electrical Section meetings. This will be the second such exhibit held since the conclusion of the war.

Plans had been made for the Electrical Sections to meet jointly with the Coordinated Mechanical Associations, with the railway electrical supply companies and the railway mechanical supply companies holding exhibits on alternate years. This appeared to be an effective means of promoting coordination of electrical and mechanical work, but it was necessary to abandon the plan because meeting room and hotel facilities were not available to handle so large a gathering.

By itself, the forthcoming electrical convention promises to be one of considerable importance. The 1946 exhibits showed that much important development work was being done by the manufacturers, but it was too soon after the war for them to have much fully developed new equipment. Now, after an interval of two years, they are in a much better position to match their products and to create new equipment to meet the ever-growing railroad demands.

The importance of the Electrical Section meetings is indicated by the amazing increase in the use of electrical

equipment by the railroads. To cite one example, the motors and generators installed last year in the new Diesel-electric locomotives constituted seventy per cent of all the direct-current machinery built in the United States. To this may be added all the necessary auxiliary apparatus and control equipment. Other things, such as passenger cars with much intricate electrical equipment, are also making new demands on the electrical departments.

Several things are immediately apparent. The work done by the Electrical Sections is of great importance to the railroads. Electrical and mechanical equipment must work in close coordination and the railroad departments responsible for operation and maintenance must arrange for similar cooperation. Such a large part of the new work is electrical that railroads must exert real effort to acquire and train men, if the new equipment is to fulfill the purpose for which it was purchased.

The work of the committees and the exhibits of the manufacturers will do much to indicate the character of railroad requirements. Each railroad must itself determine what it needs in the form of trained personnel, and how to acquire it, and what must be the extent of the required facilities. Those who stay out of trouble will do a bit of anticipating.

An Opportunity You Cannot Afford To Miss

The years since the end of the war have been marked in the railroad industry by significant changes in the character of motive power and rolling equipment and as the post-war programs of the installation of new equipment proceed at an accelerating rate the problems of servicing and maintaining this new equipment multiply with each new unit that goes into use. There was a time when both locomotives and cars were relatively simple of design and construction and the maintenance problem was likewise simple. Today, however, the modern steam locomotive, the steam turbine-electric, the Diesel-electric and the modern electric locomotive are nothing but prime movers and traction equipment the entire successful functioning of which depends on a myriad of hydraulic, electronic and mechanical controls of one kind and another. Then, too, the modern passenger car with its new type of lighting, air conditioning, heating equipment and journal-box alarms add another group of control equipment to keep the maintenance men awake nights. Years ago, the men who looked after all of this equipment learned their trades in an apprentice school and in the school of hard knocks out in the shop and enginehouse. Today most of the larger railroads have spent large sums of money for the building of elaborate instruction cars designed to train both operating crews and maintenance men.

Over all these thousands of mechanics, boilermakers and electricians who perform the labor that is translated into efficient train operation are many hundreds of supervisors from the gang foremen to departmental and

general officers who have to decide the overall maintenance policies with respect to both the old and the new equipment. These are the men who form the backbone of such organizations as the Air Brake Association, the Car Department Officers' Association, the Locomotive Maintenance Officers' Association, The Master Boiler Makers' Association, and the Railway Fuel and Traveling Engineers' Association. The rate at which these technical groups have grown since they resumed their meetings in 1939 has not only been satisfactory with respect to the increase in membership but the character of the programs has been raised to higher levels. The meetings, such as are to be held at the Hotel Sherman in Chicago, September 20 to 22, offer an intensive educational course in all phases of locomotive and car operation and maintenance such as no wide-awake supervisor and general officer can afford to miss.

Typical of the kind of material that will be available for the education of those who attend the Coordinated Mechanical meetings in Chicago will be the Air Brake Association's discussion of new types of brake equipment that are used on passenger and freight cars and Diesel-electric locomotives; the C.D.O.A.'s programs which deal with new car-shop facilities, with painting, and with maintenance work on passenger and freight cars; the L.M.O.A.'s program which deals in large part with the problems that are beginning to come to the fore in Diesel-locomotive operation and maintenance; the Master Boiler Makers' Association's reports which deal with the ever-increasing maintenance problems that are related to the more than 35,000 steam locomotives in the United States which represent better than 85 per cent of the motive power inventory, and the Railway Fuel & Traveling Engineers' Association, which will again present a large number of papers and addresses that deal with the operation of both steam and Diesel-electric power.

Since 1939, these associations have, fortunately, been in the hands of a succession of capable officers and committee chairmen. Recognizing as they did many of the shortcomings of the same and similar associations in predepression days, they set out to build the foundation of a new group of associations that would serve as the center of technical education for the officers and supervisors in the mechanical departments of our railways. That this group of men has succeeded is attested to by the fact that some of these associations are crowding the 2,000-member mark and the membership of all of the associations is a truly representative cross-section of the railroad industry.

Probably the most significant event which stands as a recognition of the work of the Coordinated Mechanical Association is a single paragraph embodied in the report of the A.A.R. Mechanical Division's General Committee at Chicago, early last month, which said, "It is recommended that the mechanical departments of member roads support these associations by allowing their supervisory officers to accept appointment to membership on committees and to attend the annual conventions."

The meetings in Chicago next month are of a nature that no progressive railroad officer or supervisor can afford to pass up. It is to be hoped that the attendance will be greater than ever before.

Lubrication Practices Are Too Widely Different

The question has been raised by a reader who is exceptionally familiar with railway lubrication problems as to why the lubricants used and the methods employed in lubricating and servicing car journal boxes should vary so widely on different railroads. The requirements and objectives of lubrication are the same and generally common to all roads. There are no fundamental differences in design and construction of the journal-box assembly to interfere with uniform lubrication and servicing. Why then are there so many different ideas regarding the best means of minimizing hot boxes which are too prevalent at all times and within the last nine months have seriously hampered railway operation.

Every lubrication problem calls for careful study before it is possible to choose the best available materials and the most satisfactory methods for servicing lubrication. No one will question or discount the prodigious amount of thought and the continual seeking by almost every car man for some solution to the problem that he considers to be almost personal. From the great number of current suggestions and ideas covering about everything from changes in oil and waste specifications to gadgets to aid lubrication, it is apparent that car journal lubrication is not unlike a man lost in a forest, as periodically the cycle of trial and error is repeated.

Every railway practice was a problem before it became a practice, and after 100 years of lubricating car journals, this particular type of lubrication is still referred to as a problem. The principal reason is that railroad men have not been able or willing to recognize and associate themselves with the basic idea that the answer to this problem is common to all railroads.

It is not difficult to visualize the complications encountered in waste-packed car journal boxes and the necessity for a compromise between good lubricating practice and operating expediences. However, the evils of compromise could be considerably discounted if the much-too-wide field of choice in the use of lubricants, both new and renovated, were considerably narrowed. This basic fault is encouraged by the broad specifications of the A.A.R. for car oils and waste, and the much-too-liberal rules governing the servicing of journal boxes.

One of the encouraging objectives of the comprehensive research program on all phases of the conventional journal box assembly, undertaken by the A.A.R., Mechanical Division in the laboratories of the Railway Service and Supply Corporation at Indianapolis, Ind., is to determine authoritatively the major oil and waste characteristics required for the most economic and efficient lubrication performance under widespread climatic conditions, and to establish closer limits in

specifications and rules to assure uniformly satisfactory performance of both home and foreign cars on line.

It is hoped that this work will result in an adequate specification for both new and renovated car-journal lubricants, well fortified by comprehensive and convincing test data. It is also anticipated that the general dissemination of factual information, resulting from the research program, will for the first time reduce car journal lubrication to a point where uniformity of materials and operation will become practicable, and largely solve individual problems of car journal lubrication.

What Electrical Design Has Done for the Diesel

It is now becoming apparent that the purchases of electrical machinery for land transportation in 1948 will equal or exceed other purchases of similar equipment. This is due primarily to the rapidly expanding use of Diesel-electric locomotives. This growth has also been materially aided and abetted by improved designs of generators and motors which have made it possible for locomotives to meet increasing load and speed demands.

A summary of these developments, as they affect generators is included in a paper, "The Locomotive Traction Generator Comes of Age," which is published elsewhere in this issue. In connection with this article, it is pointed out that evolution of design has produced generators which weigh little more than half as much and cost less per kva. than similar machines for stationary application. Why do not all stationary machines follow the same principles of design?

The answer to this question lies first in the fact that the railway generators cost about twice as much per pound and weigh about half as much per rated kva. Second, it must be understood that it is kva. rating which is used for comparison, and a railway generator must develop large volumes of current with low voltage at low motor speeds and relatively low current values and high voltage at high motor speeds. It is the maximum current and maximum voltage ratings which establish the "wrap-around" kva. rating. If weight and cost factors were measured in kw. rating, the railway machines would not appear to such good advantage, but this would not be a proper comparison. Finally, the standard stationary machines may be recommended for various speeds and voltages while railway generators are designed for a specific purpose and can be used for that purpose only.

This should in no way discredit the railway machines. They are equal in cost per kva. rating, they can operate through wide load swings and rapid temperature changes with good commutation, they can stand the abuse of railroad locomotive service, and being light in weight, they produce small gyroscopic forces and afford a minimum of resistance to the forces of acceleration and retardation. Beyond a question of doubt, constantly improved generator and motor design have been an important factor in establishing the present position of the Diesel-electric locomotive in railroad service.

ELECTRICAL SECTION

The Locomotive Traction Generator Comes of Age*

OVER 2,100,000 horsepower of Diesel-electric locomotives was produced in the United States during 1947. Other internal power locomotives, such as steam-turbine electric or gas-turbine electric and motor-generator locomotives, were built in very small quantities, but for our purposes may be added to the above total. All of these locomotives incorporate d.c. traction generators of specialized design. Taken together, they account for the surprising figure of 70 per cent of the total d.c. generator production of the entire United States for the year.

Compact Lightweight Design

For a generator which is to be applied to locomotive service, small physical size (especially minimum over-all length) and light weight are items of paramount importance. These two requirements lead to a number of differences in design proportions as compared with the conventional generator built to spend its lifetime in a more or less fixed location. Traction generators are commonly designed with a large number of poles in relation to their capacity, since such machines tend to be relatively light in weight, and have short end windings and short commutators. Further shortening of the commutator by accepting higher than normal current density in the carbon brushes can be accomplished, provided the commutation factors and commutator surface conditions are made sufficiently favorable. Class B heat-proof types of insulation

*A paper presented at the summer meeting of the American Institute of Electrical Engineers, held in Mexico City, Mexico, June 21-25, 1948.

†Designing engineer, Transportation Motor Engineering Division, General Electric Company, Erie, Pa.

By Richard Lamborn†

Evolution of design has produced traction generators which weigh little more than half as much and cost less per kva. than similar machines for stationary application

are used in all locomotive traction equipment because of the very considerable reduction in amount of active material made possible by the 120 deg. C. permissible continuous operating temperature rise.

All features of the mechanical design are made as simple and lightweight as torsional vibration conditions, buffing shock loads, and general overall stiffness considerations will permit. Length required for purely mechanical functions is held to the minimum by building single-bearing machines having an anti-friction bearing at the commutator end, and a bolting rabbet at the fan end of the armature spider to permit attachment to the driving flange of the prime mover. Such generators are often completely end-bell supported which makes a short reasonably large diameter or "pancake" design much to be preferred to a longer, smaller diameter or "sausage"

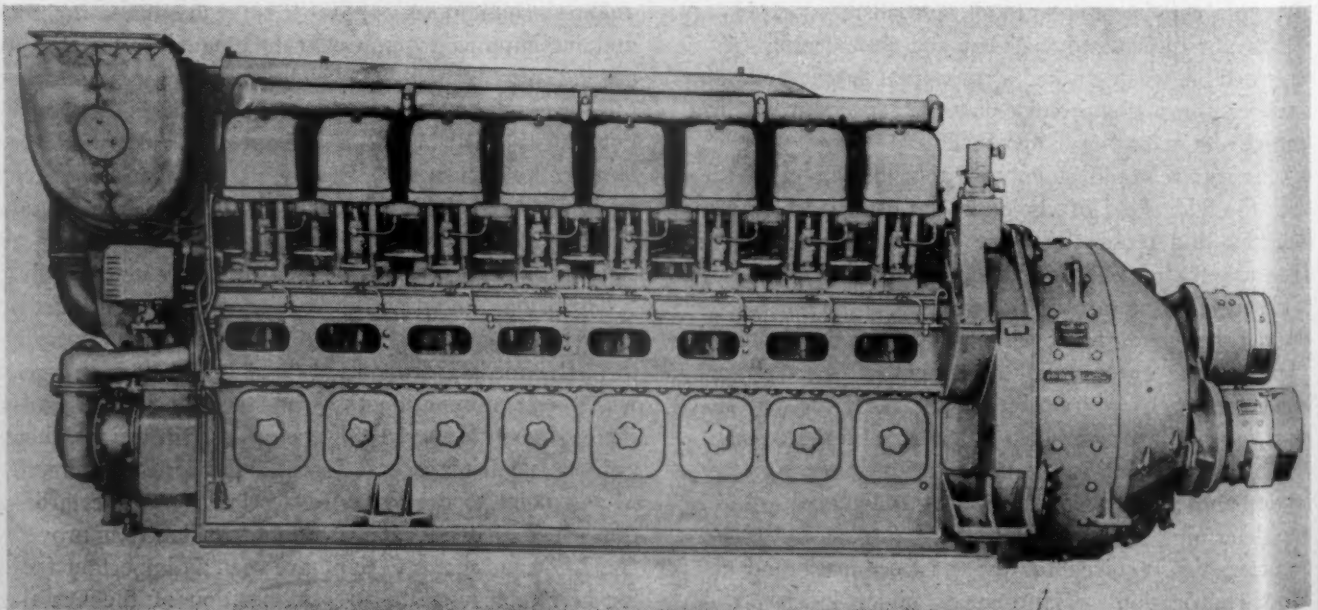


Fig. 1—Side view of 2,000-hp. Diesel-electric locomotive engine-generator

design, even though the latter might be slightly less expensive to manufacture.

Typical locomotive traction generator construction is illustrated in Fig. 1, which shows the side view of a 2,000-hp. Diesel-electric locomotive engine-generator set, and by the section drawing, Fig. 2, which shows the proportions of a somewhat smaller generator also built for end-bell mounting.

Concepts of D.C. "Kva." and "Wrap-around"

When operating at rated load, prime movers such as the Diesel engine or the gas turbine are fundamentally constant torque output devices. Railroadng, on the other hand, demands high power outputs over a wide range of operating speed, which involve a widely variable torque demand. It is the flexibility and reliability with which electric drive can provide the required variation and multiplication in torque between the prime mover and the driving axles that account for the phenomenal growth of this branch of the electric industry.

The required electrical size or D^2L (where D = diameter of the armature core and L = stacked height of the

ing 1,500 hp. net input will develop approximately 1,040 kw. output, and in locomotive service this output may be required on a continuous basis anywhere within the range between 1,000 volts at 1,040 amp. to 500 volts at 2,080 amp. In other words, the generator must be large enough to rate 1,000 volts and to also rate 2,080 amp., although these do not occur simultaneously. In such a case, stating the capacity in terms of maximum rated volts x maximum rated amperes/1,000 or $1,000 \times 2,080/1,000 = 2,080$ kva. comes much closer to defining the size or D^2L required than the more conventional method of stating generator capacity in terms of kw.

This same requirement may be expressed in a slightly different form by determining the ratio of maximum rated amp. to amp. at maximum rated volts or $2,080/1,040 = 2$, and defining the generator size by saying it is a 1,500 hp. input machine with a 2 to 1 continuous rating "wrap-around"; i.e. the range of currents over which the generator output must be extended or wrapped around the constant input volt-ampere hyperbola. The amount of "wrap-around" rating required in the generator of an internal powered locomotive depends chiefly on such factors as hp. per ton on drivers, maximum locomotive speed at which full power is developed, traction motor characteristics, and motor control connections or combinations used. The relative effect of each of these factors can best be understood by working through a typical example with reference to Fig. 4.

Wheel Horsepower and Locomotive Speed

Let us assume we wish to determine the amount of generator continuous rating "wrap-around" required on an 80 m.p.h. Diesel-electric road-freight locomotive weighing 115 tons, having 4 axles, all motored and equipped with a Diesel engine capable of developing 1,500 hp. net for traction. To start with, general practice in freight locomotive service is to provide a maximum tractive force for acceleration purposes equal to 30 per cent of the locomotive weight, which in our case would be $0.30 \times 115 \times 2,000 = 69,000$ lb. At the other end of the operating range, full available engine power should be transmitted to the rail up to at least 90 per cent of the maximum permissible speed, or $0.90 \times 80 = 72$ m.p.h. Assuming 93 per cent as a typical value of efficiency for the generator and 90 per cent efficiency for the traction motors, the tractive force corresponding to this speed

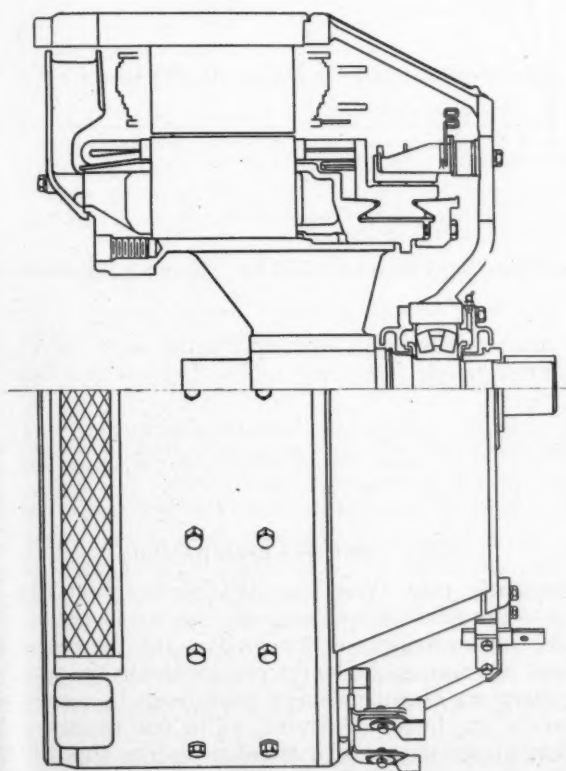


Fig. 2—Half section of typical locomotive traction generator designed for end-bell mounting

armature core) of a generator in stationary applications can usually be fairly accurately estimated from the horsepower and speed of the prime mover. However, the situation is somewhat more complicated in the case of generators applied in traction service. As a means of contributing their share to the torque range of the electric transmission system, traction generators are equipped with a means whereby their excitation is automatically regulated to make them deliver their full kw. output at high voltage and low current as well as at low voltage and high current, as indicated in Fig. 3.

The specific range of volts and amperes over which such a machine is required to operate continuously becomes an important factor in determining its size. For instance, a generator driven by a Diesel engine deliver-

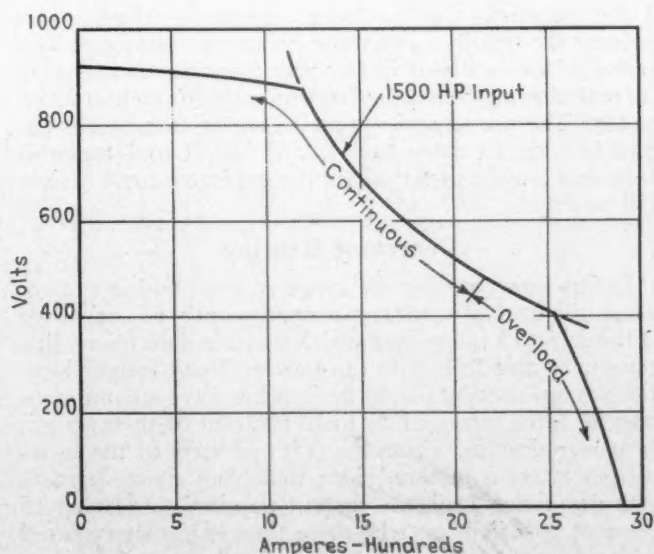


Fig. 3—Locomotive traction generator volt-ampere output characteristic

would be $0.93 \times 0.90 \times 1,500 \times 375/72 = 6,540$ lb. From these two calculations, we obtain the range in tractive force or torque values which must be handled at full power by the electrical transmission equipment as $69,000/6,540 = 10.55$ to 1.

Since the torque developed by a motor is equal to some constant multiplied by flux and by armature current, it follows that the product of motor flux times motor current must be capable of variation over a 10.55 to 1 range to satisfy the requirements of our hypothetical locomotive application. On the average, a typical railway traction motor operating at rated horsepower would probably be limited to a 2.5 to 1 flux change by either heating, commutation, or flashover considerations. This means that

that the generator must handle on a continuous basis will be required immediately following the transition from the series-parallel to the full-parallel motor combination. It would theoretically be exactly twice the current corresponding to the maximum rated voltage point of the machine. However, the maximum continuous rated load is often chosen as about 90 per cent of this value because the resultant saving in size and weight of generator is considered more worth while than whatever life may be sacrificed from such over-temperatures as occur during the occasional periods of operation in the resulting small overload current zone. Thus we arrive at a $0.9 \times 2 = 1.80$ to 1 range of volts and amp. as the continuous rating "wrap-around" required of the traction generator. To

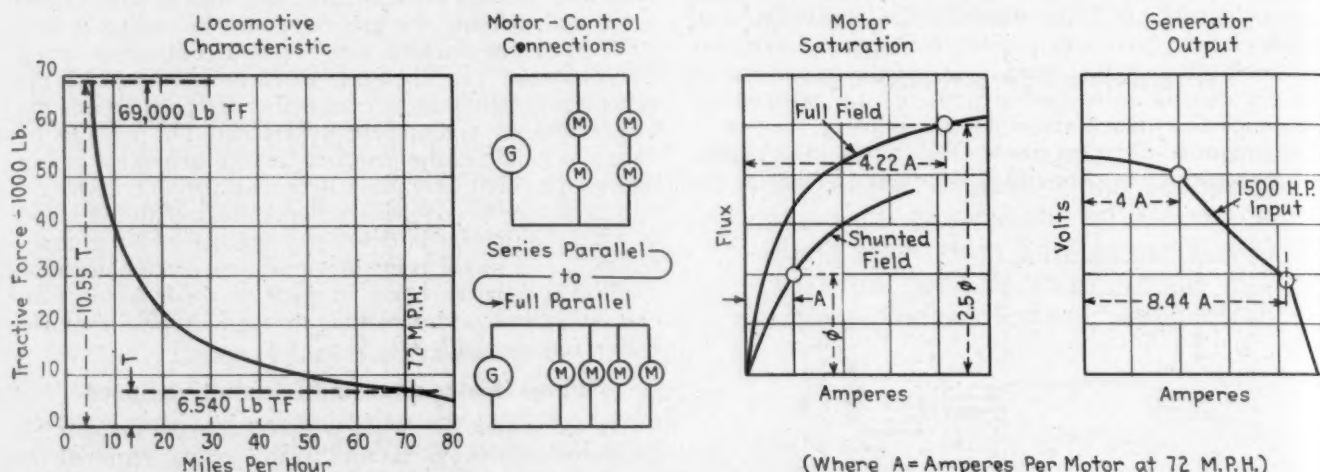


Fig. 4—Steps in determining "wrap-around" requirement of traction generator for 115-ton, 1,500-hp., 80-m.p.h Diesel-electric freight locomotive

the power delivered to our motors must be varied over a $10.55/2.5 = 4.22$ to 1 range of current values in order that they may be able to successfully handle full output over the required 10.55 to 1 range of torques.

A 1,500-hp. generator capable of delivering its full kw. rating over a 4.22 to 1 range of currents would be a very large and heavy machine indeed. This condition can be greatly improved by providing a few relatively light-weight contactors to connect the traction motors in two parallel groups of two motors in series during acceleration and low speed operation, and to later reconnect them so as to place all four motors in parallel across the generator terminals for the higher operating speeds. This reduces the required generator current output range by a factor of two without in any way affecting the range in current flowing through the windings of each traction motor. The use of series-parallel motor connections has thus brought us down to a $4.22/2 = 2.11$ to 1 range of volts and amperes over which the generator must deliver full power.

Generator Heating

Let us now consider the range of volts and amp. over which the generator must rate continuously as contrasted to the 2.11 to 1 range over which we have determined that it must be able to handle full power. Road freight locomotives are conventionally designed to have a continuous tractive force rating of 15 to 16 per cent of their weight on powered axles. From the point of view of the series excited traction motors, since their flux must decrease with decreasing load, the current required to develop 15 per cent adhesion must be more than half that required to develop 30 per cent adhesion. It follows that the continuous traction motor rating must occur in the series-parallel motor connection. Hence the maximum current

recapitulate, the ranges over which the electrical equipment must handle full power on our hypothetical locomotive are:

- 10.55 to 1 for traction motor torque
- 4.22 to 1 for traction motor current
- 2.11 to 1 for generator current
- 1.80 to 1 for continuous rated generator current

Other Control Combinations

Frequently more than one feasible solution can be found to the problem of designing the transmission system for an internal-power locomotive, and the best solution will not necessarily be the one involving the smallest size generator. If using a single traction motor connection involves a big heavy generator, as in our example, the addition of series-parallel control to reduce the demand on the generator will effect a very appreciable saving in the cost and weight of the overall transmission. But as smaller sizes of apparatus are approached in lower horsepower locomotives, a point will be found where the additional cost of a larger size generator required by the use of a single motor combination will be largely offset by savings in first cost and installation cost of those control items which are no longer required. Quite naturally, the choice will be biased in favor of the single motor connection alternative by consideration of such customer advantages as lower maintenance because of the simpler control equipment and improved service performance due to the locomotive being less "slippery" with only half as many motors in series under the high tractive force conditions.

Although the generator applied in a single motor connection transmission system always requires increased overload commutating ability, the chief pitfall in designing such a machine is more apt to be one of heating. Gen-

erally speaking, it is not adequate to design such a generator to have a continuous current rating corresponding to the combined continuous rated current of the traction motors in their operating combination. If this were done, it would be found that the generator could readily become badly overheated during operation at its maximum overload current while the traction motors were still within acceptable temperature limits. This to a large degree results from the fact that the load loss in the motor armature will be very low under such conditions because of its very low speed when exerting high torques, while the load loss in the generator armature will be very high because it may be running at or near its maximum speed. To be a safe, a generator on a single motor combination locomotive should have a 15 or 20 per cent higher continuous amp. rating than the combined continuous ratings of the motors it supplies.

The optimum relative proportions of any specific locomotive transmission are likely to be distorted or compromised to some degree by the practical necessity of choosing from existing standard sizes of apparatus. Nevertheless, several general trends can be noticed in the data in Table I which presents a break-down of the over-

and fixed maximum full-power speed, the required traction motor torque range is inversely proportional to the prime mover horsepower. From here it is but a simple step to the realization that if weight and utilization speed are established, increasing the horsepower will not involve a proportionate increase in the size of the electrical transmission equipment.

Switcher Generators

Thus far, the entire discussion regarding ratings has referred to what is commonly classed as road locomotive type of service which implies that all the equipment has been designed to permit sustained full power operation. While this is by far the more glamorous field for the design and application engineer, there are two other distinct classes of service for which Diesel-electric locomotives are built in large quantities. One of these is railroad yard switching service. Because of the low load factor in this type of operation occasioned by the frequent on-and-on nature of the power requirements and many light load movements, it is permissible to design such an electrical transmission with somewhat reduced ratings and to rely upon the reduced load factor and low r.m.s. ef-

Table I
Overall Transmission Characteristics of a Number of Typical Diesel-Electric Locomotives

Item	Locomotive specifications Including horsepower for traction; weight on drivers; maximum speed at full power; and traction motor connections used	Traction motor torque range	Traction motor flux range	Traction motor current range	Generator current range	Continuous rated Gen. current range
A	600-hp., 70 tons, 50.5 m.p.h., utilization; 2S2P FS-1, 4P FS-1, 4P FS-2	11.20 to 1	2.69 to 1	4.16 to 1	2.08 to 1	1.82 to 1
B	1,500-hp., 115 tons, 72 m.p.h., utilization; 2S2P FS-1, 4P FS-1, 4P FS-2	10.55 to 1	2.50 to 1	4.22 to 1	2.11 to 1	1.80 to 1
C	900-hp., 93 tons, 50.5 m.p.h., utilization; 3S2P FS-1, 2S3P FS-1, 2S3P FS-2	9.37 to 1	2.76 to 1	3.39 to 1	2.26 to 1	1.48 to 1
D	2,000-hp., 110 tons, 67 m.p.h., utilization; 2S2P FS-1, 2S2P FS-2, 4P FS-1, 4P FS-2	6.45 to 1	1.95 to 1	3.30 to 1	1.65 to 1	1.49 to 1
E	2 x 210 hp., 80 tons, 16 m.p.h., utilization; 2 (2P) FS-1, 2 (2P) FS-2	6.26 to 1	2.29 to 1	2.73 to 1	2.73 to 1	1.90 to 1
F	2 x 400 hp., 51 tons, 50.5 m.p.h., utilization; 2 (2P) FS-1, 2 (2P) FS-2, 2 (2P) FS-3, 2 (2P) FS-4	6.56 to 1	2.94 to 1	2.23 to 1	2.23 to 1	1.59 to 1

Abbreviations designating motor connections are: S = Series; P = Parallel; FS-1 = Full exciting field strength; FS-2 = Reduced field strength; FS-3 = Further reduced field strength; etc. For example, 2S2P FS-1 indicates four motors operating on full field strength, connected with two parallel groups of two motors each in series connected across the generator terminals.

all transmission characteristics of a number of typical Diesel-electric locomotives. Item B represents our hypothetical locomotive which, except for an added complication in the control that was omitted from our example for the sake of simplicity, is identical with a currently very popular design of road freight locomotive. The other five items are all actual locomotives as being manufactured today.

The first two locomotives listed serve to emphasize the fact that a generator used with a 2 to 1 series-parallel traction motor combination requires a 1.8 to 1 continuous rating "wrap-around". Using either an additional control connection on a four-motor locomotive in which the motor fields are shunted in series-parallel before going into full parallel (Item D), or a 3 to 2 series-parallel combination on a six-motor locomotive (Item C), serves to reduce this required rating "wrap-around" to approximately 1.5 to 1. Translated into physical terms, this makes possible a reduction of approximately 15 per cent in the amount of active generator material required as compared with the straight 2 to 1 series-parallel type of control. No general rule for the required generator rating "wrap-around" on single motor combination locomotives (Items E and F) should be attempted, as it depends as much on the characteristics of the particular traction motor used as on any other factor.

A study of the tabulation as a whole serves to again point out the fact that for a locomotive of given weight

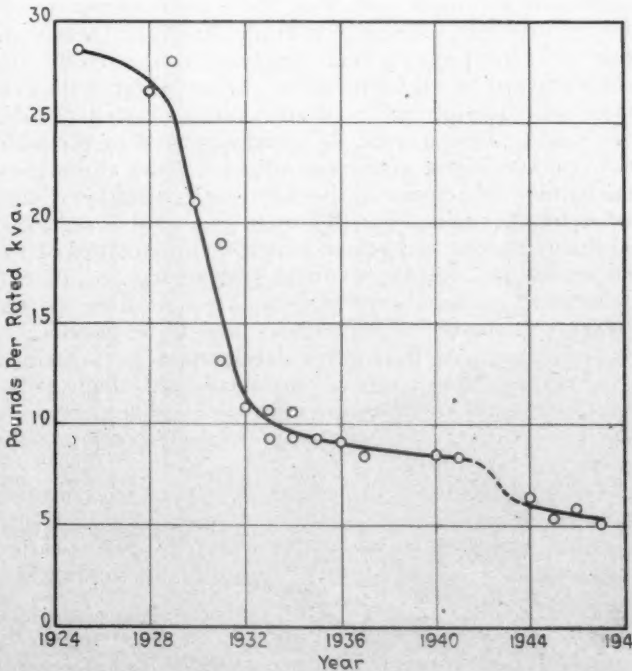


Fig. 5—Weight trend of locomotive traction generators

fective current to prevent overheating of the equipment.

Locomotives designed for use by industrial plants constitute the third major classification. Many industrial railroad systems have such a small total length of track that it is almost impossible to think of service on them in terms of continuous rating or continuous operation. In fact more than 600 such locomotives of one particular design have been operating successfully for years with generators so small in size that they cannot be operated continuously at any point on their full hp. volt-amp. characteristic curve without exceeding A.I.E.E. Class B permissible temperature rises. Designing for such special applications should, of course, be based on actual service experience whenever possible rather than on any generalized rules such as here developed for the road locomotive type of service.

Automatic Regulation of Output

Another factor which influences the size and weight of a generator to some extent is the particular means employed to obtain the automatic regulation of its output over the required range of current and voltage. There are at least five different schemes in general use ranging from the simplicity of a self-excited generator which depends entirely on the stalling characteristics of a Diesel engine for its ability to produce a "wrap-around" type of output curve, to the amplidyne exciter which, in conjunction with the electro-hydraulic governor; (1) prevents engine overloading or stalling at all engine speeds and has the further ability of adding pre-determined voltage and current limit cut-offs; (2) to the generator hyperbolic volt-ampere characteristic. The self-excited generator with stalling control is used only on small capacity power plants such as those designed for industrial service where minimum first cost is an important objective.

Second in order of increasing complexity is the scheme using a controlled saturation type of differential field exciter. It has been successfully applied to a large number of switching locomotives and does an excellent job of matching the generator's demand to the engine's output ability under one specific set of design conditions. However, it lacks ability to correct for variations in torque demand of the generator such as those caused by higher or lower than normal exciting field temperatures or for variations in torque ability of the Diesel engine due to fouled injectors, change in altitude, or normal wear and tear. The third scheme is an outgrowth of the second, and since it overcomes the difficulties just enumerated, it meets the essential requirements of an excitation system suitable for road type of service. It is characterized by the addition of an engine governor servo-operated rheostat in the battery field circuit of the controlled-saturation exciter whereby the excitation of the main generator is regulated so that its output is made to match the capabilities of the Diesel engine. Neither of these systems has an inherent generator overload current limit feature. The partial power volt-ampere characteristics tend to be undesirably flat for optimum locomotive accelerating performance, and the excitation tends to be unnecessarily high at the lighter loads beyond the point where the volt-ampere curve has departed from the constant horsepower portion of the characteristic.

The fourth scheme uses no exciter, but requires three exciting field windings in the generator; namely—self, separate, and differential, with a governor servo-operated rheostat in the battery-excited separate field winding cir-

cuit. Naturally, the rheostat and its servo-mechanism must be much larger when working directly on the main generator field than when working on the field of an exciter. In such a generator the field structure must be relatively deep to accommodate the greater gross number of ampere turns resulting from the use of an opposing series differential winding, and to allow for the extra amount of insulation needed when using a multiplicity of field windings.

The fifth scheme based on the use of the amplidyne type of exciter requires the smallest capacity of servo-operated rheostat, produces the most desirably shaped family of partial power characteristic curves, and by providing definite overload and over-excitation protection, permits the designer to use the minimum of material in the construction of the generator stator parts.

Other Generator Functions

In addition to the primary function of providing power for propelling the locomotive, the traction generator usually has other secondary functions. On locomotives using Diesel engines as their prime movers, it is almost universal practice to "motor" the traction generator from a storage battery in order to crank the engine and get it started. In the case of the gas-turbine type of power plant, supplying power to the main generator promises to be the preferred way of bringing the turbine-compressor unit up to a self-sustaining speed as well as for turning it over slowly during the cool-down period required prior to the actual shutting down of a unit that has been up to operating temperature. Similarly on the motor-generator set type of trolley locomotive, motoring the traction generator from some auxiliary source of d.c. power is the preferred method of getting the synchronous motor above half speed where the single phase power can effectively accelerate and pull it into step. A separate series winding is built into the generator for this starting duty on small and medium-sized machines, but in the largest size units the series winding is sometimes omitted and control equipment added to permit the use of the machine's regular separate excitation winding for the motoring operation.

A more recent function, which at the present time is required only on locomotives used in road freight or road passenger service, is that of providing excitation for the traction motors when they are operating in their braking connection. Electric braking is accomplished by connecting the traction motor armatures to a set of forced air-cooled grids, and regulating their excitation to suit the braking requirements of the train. The separate excitation power for these motor series fields is required at a relatively low voltage, and is obtained from the traction generator while being driven at the minimum operating, or idling, speed of the prime mover. This requirement seldom involves any heating problem, but may offer one in stability of operation, as proper equalization of the load between similar units operating in multiple from a single head-end control station is a universal requirement. Arranging the traction-motor field excitation circuit to include the generator cranking winding so that it will act as a differential series exciting winding is one means of at least improving the equality of load between units.

Traction generators have at times been used to furnish at least a portion of the auxiliary power requirements of the locomotive. In certain switcher locomotives, they have been arranged to charge the storage battery whenever the engine was idling, with the traction motors consequently disconnected from the generator circuit. In other cases, motor-driven air compressors or blowers have been operated from the variable voltage delivered by the generator while it was supplying power for traction. Such

(Continued on page 111)

¹⁾"A Power Plant Regulating System for Diesel-Electric Locomotives" by C. B. Lewis, Associate A.I.E.E., General Electric Company, Erie, Pa. A.I.E.E. Technical Paper 47-39, Dec. 1946.

²⁾"Developments in Diesel-Electric Traction-Generator Excitation Control Systems" by C. A. Branche, Associate A.I.E.E., and G. M. Adams, Associate A.I.E.E., both of General Electric Company, Erie, Pa. A.I.E.E. Technical Paper 47-37, Dec. 1946.

Power and Light for Terminals



The yard as it appears at night

To meet the growing electrical requirements of its seven tenant roads, the Cincinnati Union Terminal Company has equipped a portion of its service yard with an entire new lighting system and has provided both this section of the yard and the station tracks with high-capacity, well-protected facilities for precooling and battery charging. The lighting units are mounted on H columns and mast arms. There are standby power outlets at 80-ft. spacing for all tracks in the station and in the east one-

Cincinnati Union Terminal is now equipped with exceptionally fine lighting for service tracks and power outlets with cross-track feeders insure adequate power for precooling and battery charging

third of the yard. Power supply for both lighting and standby outlets is obtained from a row of transformers extending along either side of the service yard, and terminal tracks with secondary feeders run at right angles across the tracks. This arrangement insures that a feeder outage will not cause the loss of power to a whole train or to a row of platform lights.

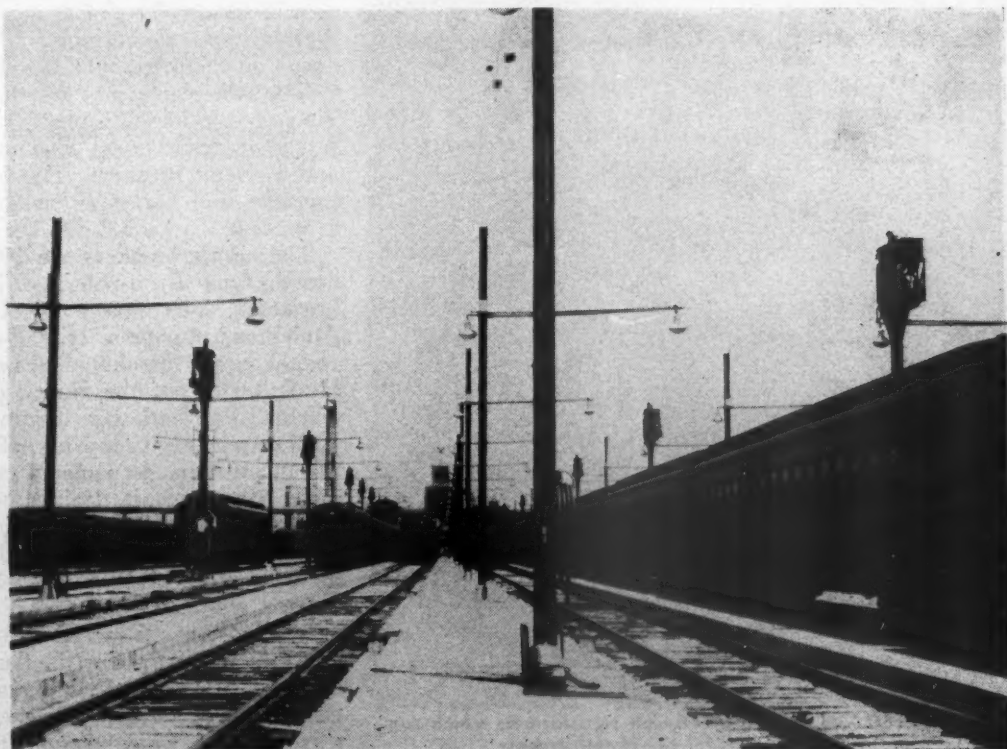
Train Servicing

Incoming trains are moved from the station to the service yard tracks where they are first placed over a 1,000-ft. inspection pit. When they have passed inspection, they are moved to the servicing tracks where they are cleaned and serviced. Servicing includes light repairs to electrical equipment, battery charging, and testing of air conditioning equipment. Some precooling is also done in the yard.

After the work in the yard is completed, and provided there is track space available at the station, the trains are moved to the tracks in the station. In some cases, trains are broken up and remade, and in others, they are kept intact as complete trains.

Cars at the station are precoolled in warm weather and batteries are charged if necessary. At times, precooling and charging are carried on simultaneously, power

The service yard in the daytime showing the arrangement of lighting and transformer poles





A light pole and bracket light

from a second 3-phase, a.c. outlet being used with a portable battery charger. Since the flow of traffic through the terminal is not uniform, it is necessary to have sufficient electrical and other servicing facilities to take care of peak conditions.

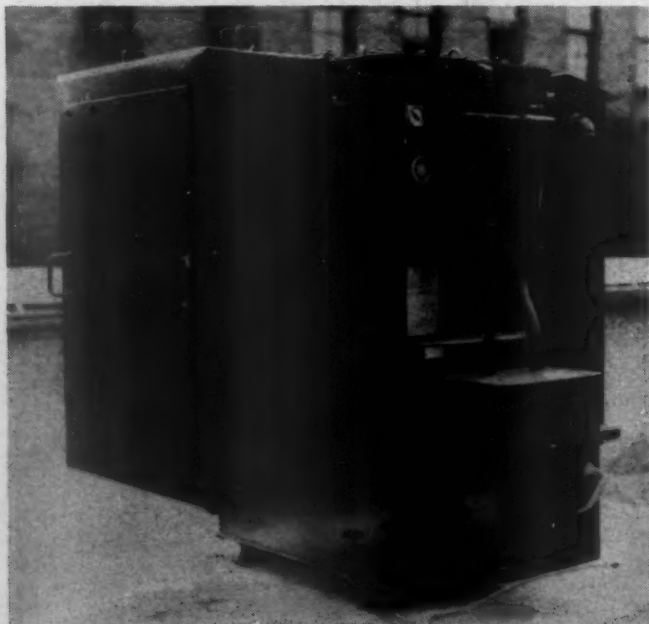
Standby Power in the Yard

The standby outlets in the yard consist of 3-phase, 240-volt, a.c. outlets, placed 80-ft. apart in the gutters on either side of the yard platforms. Each outlet box enclosure is adjacent to a drain and the box itself constitutes the high point from which water flows to the next drain.

Power for the outlets is obtained from pole-mounted transformers placed along the east and west side of the yard. The transformers on opposite sides of the yard are staggered, so that one on the east supplies a 240-volt secondary feeder which runs west, clear across the yard, and the next transformer on the west side supplies a feeder which runs east across the yard.

The transformer 2,400-volt primaries in turn are run south along each side of the yard from the power source (substation) and may be connected to form a loop. Normally, the loop is kept open at the south end of the yard.

The 2,400/240-volt, 3-phase transformers are located



One of the 150-kva., 13,200/240-volt transformers which supplies the standby power outlets for the station tracks

on every other lighting pole in the two outside rows, and are 160 ft. apart. The poles are H section columns, 10-in. columns being used for transformer poles, and 8-in. for those which support lights only. The 2,400-volt feeders consist of 2/0, three-conductor, varnished cambric, lead-covered, 5,000-volt cable run in 4-in. Transite



One of the standby power outlets as installed in the gutter beside a yard platform

duct and carried up each transformer in rigid metal conduit. At each transformer, there is a three-way, load-break oil switch. This permits sectionalizing the 2,400-volt line, as well as disconnecting the transformer. Each half of the 2,400-volt circuit normally serves seven power formers, and one lighting transformer. Transformers are fused on the primary side by oil fuse cutouts.

The secondary lines are three-conductor, 250,000 c.m. Neoprene-jacketed cables in 3-in. rigid metal conduit placed underground. The outlets include a receptacle, and a circuit breaker. The outlet box provides for two breakers and two receptacles, but only one is installed at present.

The circuit breakers are 100-amp., 250-volt, Westinghouse, type F, 3-pole, no fuse, quick-acting, De-ion breakers. The outlets are 100-amp., Albert & J. M. Anderson, four-pole, type F-4 receptacles. The boxes for the circuit breakers and receptacles were designed by H. F. Ortlip, of the Harry F. Ortlip Company, Philadelphia, Pa., and were manufactured by the Albert & J. M. Anderson Company. The box which is shown in the illustrations is made of cast metal, is set in a concrete box which is drained to sewer connection. The metal conduit is brought into the bottom of the box. There is a flange with a machined finish on the end of the conduit and this is secured to a machined surface on the box with cap screws. This joint forms a part of the ground circuit. Concrete is poured around the conduit up to the upper level of the flange.

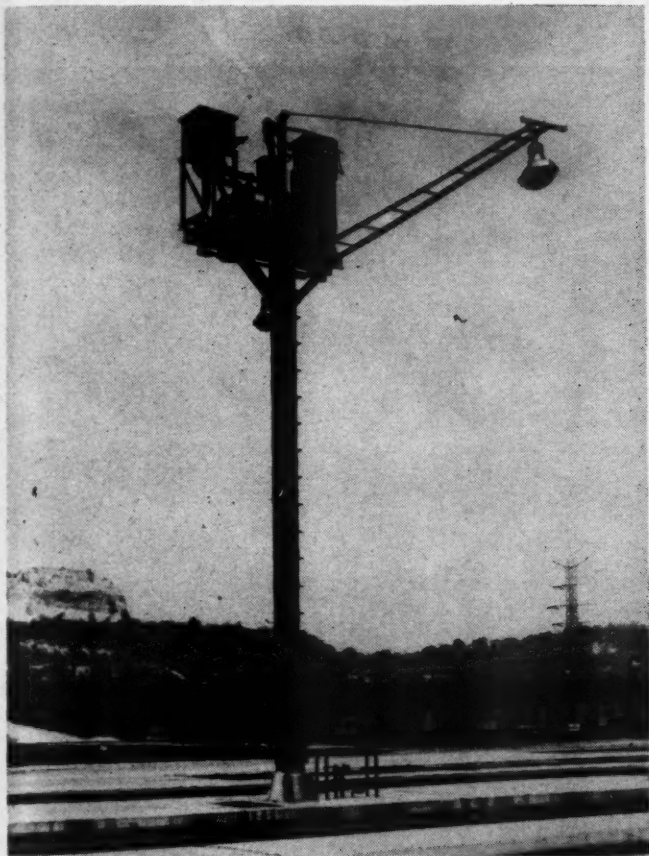
The cable is sealed with compound where it is brought out of the conduit. At each transformer pole, there is a ground wire which grounds the tank to the transformer

and the conduit on the pole. The ground is connected to the underground yard water line.

The portable cables are 50 ft. long. They consist of No. 4, three conductor type G, mining machine cable with a Neoprene jacket, which contains 3 power conductors and three smaller ground wires. This arrangement of conductors makes a cable of only 1.2 in. in diameter, as compared with a cable which has four conductors of equal size and which must be considerably larger in diameter.

Battery Charging

Battery charging in the yard, other than that done by motor-generator sets on the cars, is done by portable, motor-generator type chargers. The motor is a 25-hp.



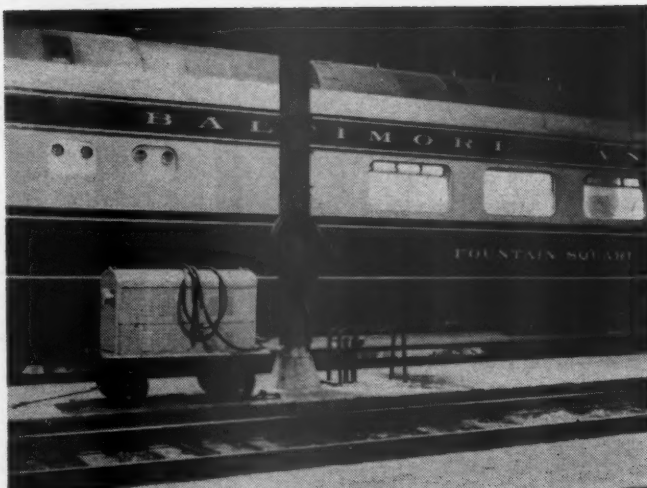
One of the 10-in. columns in the yards which supports both a standby power transformer and a pole, and a bracket-mounted light

machine, and the generator is rated 300 amp. at 45 volts, or 150 amp. at 90 volts. The set is mounted on a four-wheel chassis, having rubber-tired wheels and a hand bar and towing lever. It is fitted with two, 150-amp., d.c. charging receptacles.

There are seven, m.g. charging sets in the service yard, and nine rectifier type chargers at the station. There will also be three portable gasoline-engine-driven machines which can deliver 150-volt, d.c. power, or 30-kw. of 220-volt, 3-phase, 60-cycle a.c. power. These will be used in the yard.

Yard Lighting

There are 104 lighting units in the yard, mounted on poles and on mast arms. There are six regular service tracks and seven platforms. This provides for a platform on the side of all cars being serviced. There is also a seventh track outside the platform at one side. This is used to store protection cars for added train service requirements.



A car in the service yard showing how it appears at night under the illumination supplied by the overhead lighting system—One of the m.g. battery-charging sets is shown on the platform

The tracks are on alternate 20-ft. and 16-ft. centers. This makes alternate wide and narrow platforms. The poles are spaced at 80-ft. intervals on the wider platforms. Lighting units on the poles light the platforms and the sides of the cars adjacent to the wider platforms. Mast arms, mounted on the poles support lighting units over the narrow platforms.

All lighting units are mounted 22 ft. above the platforms. Of the 104 lights, 52 are 400-watt, 20,000-lumen, mercury vapor lamps and 52 are 750-watt, incandescent lamps. All are in O.V. 20, top-mounted Westinghouse fixtures. The poles are offset from the center of the platform to allow a wide aisle for trucking and all lights are over the centers of the platforms.



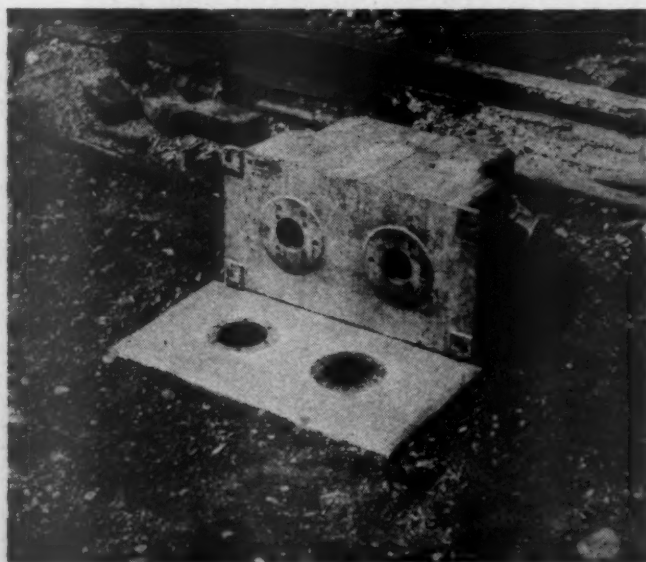
The 1,000-ft. inspection pit



The cables which are to be run into the standby power outlet boxes are sealed into the ends of the conduit with compound

After being in service for five months, without cleaning, lighting measurements show illumination intensities of .24 to 4.9 vertical footcandles on the sides of the cars and 1.0 to 4.3 horizontal footcandles on the platforms. Normal cleaning period will be every three months.

In the 1,000-ft. inspection pit, there are 40 lighting units on each side. They are spaced 25 ft. apart and are staggered on 12½-ft. centers. They consist of a 200-watt lamp in a reflector recessed into the side of the pit. There are also 120-volt utility receptacles in alternate



An outlet box on its side showing how it is attached to the flanges on the ends of the conduits

lighting niches for portable extension cords for lights and small tools. There are also similar outlets on every other pole in the yard.

Power for lighting is distributed from two, 45-kva., 3-phase lighting transformers placed in the center of the yard. One of these transformers is supplied from the 2,400-volt feeder on the east side of the yard and the other from the feeder on the west side.

Secondaries are 4-wire, 120/208-volt circuits. There is a panelboard with a circuit breaker under each transformer and a third panelboard at the center. Secondary circuits feed longitudinally in both directions from the

three panelboards, and are divided so that loss of a transformer would mean the loss of every other light fed by that transformer, and the loss of one phase would mean only the loss of every fifth light along the platform.

Standby Power for Station Tracks

The standby power arrangement for station tracks is similar to that in the yards except that the outlets are located between the tracks, above ground, instead of alongside the platforms, and all primary feeders are 13,200-volt, run underground. The transformers are located on concrete pads with a high- and a low-tension manhole underneath. Primary feeders are connected at each transformer by disconnecting straps in a cabinet mounted on the transformer, and the feeders are protected by a 250,000 kva., high-speed air circuit breaker in the substation. There are 16 of these transformer



One of the standby power outlets as it is used above ground between the station tracks—The plunger operates the breaker

power centers, arranged with 8 on each side of the station tracks.

In the case of a transformer or primary feeder fault, the high-speed breaker goes out, and a signal system indicates which circuit is in trouble. This circuit is then opened by an air-break disconnecting switch and the breaker is reclosed. After the faulty transformer has been disconnected at its own power center location, this circuit may again be reconnected at the substation.

Secondary circuits from the power centers are protected by 400-amp. secondary breakers in cabinets mounted on the transformers.

Primary feeders are run parallel with the tracks on either side of the station. Secondary feeders are run at right angles to the tracks, but since there are 20 station tracks, the circuits are run only half way across the tracks from either side to reduce the voltage drop.

The transformers are oil-filled and are rated 150-kva., 13,200/240-volts. They are protected by instantaneous and thermal relays which control the action of the substation breaker.

Design and engineering of the lighting and standby power installation was done by the Harry F. Ortlip Company, Philadelphia, Pa., in conjunction with the Cincinnati Union Terminal Company, the Westinghouse Electric Corporation, and tenant railroad company engineers. The Ortlip Company did the construction work under a cost plus fixed fee contract.

Car Washer Improves Terminal Service

The Kansas City Terminal Railway has improved the service rendered to the eleven of its twelve tenant railroads which use its yard facilities by the use of a car washer. At the same time, it has reduced the cost of washing and has materially improved the appearance of cars going through the yard.

With 7,904 cars going through the yard in March 1948, the cost of exterior washing was 47 cents per car, including maintenance of the washer, water, electric power and cleaning chemicals. Of the 47 cents, 6.6 cents is maintenance of plant. This represents a saving of about one dollar per car as compared with hand washing. Since March, the number of cars going through the yard has been increased to about 10,000 and it is expected that this will considerably reduce unit costs.

The washer, supplied by the Whiting Corporation, Harvey, Ill., consists of two stations placed about 150 ft. apart. The cars moved through them at a speed of about one mile per hour. At the first station, they normally receive an application of cleaning chemical and are scrubbed by the brushes. Between the two stations, two touch-up men, one on each side of the car, use fountain brushes to wash car skirts, car ends, depressed doors, and any parts not touched by the brushes. At the second station, the cars are rinsed, scrubbed and rinsed.

Four men are used for the washing operation. In addition to the two touch-up men, there is one operating the sprays and brushes from the control cabin and a field man who closes doors and windows before the cars reach the washer. If the cars are sufficiently clean before they go through the washer, only water and no cleaning chemicals are used. This condition is determined by the field man who signals to the machine operator.

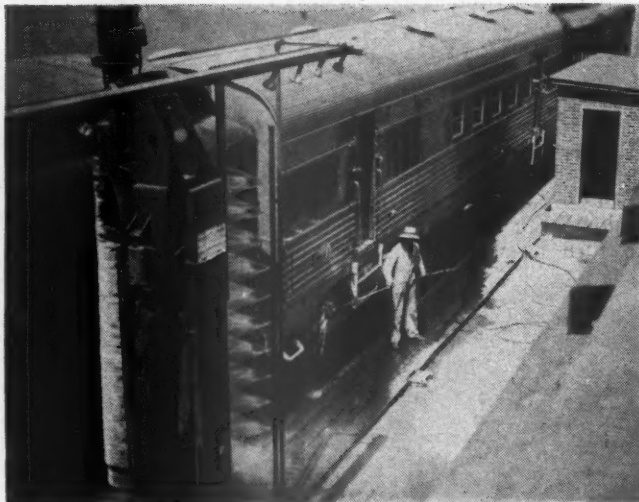
Before the washer was installed in January, 1947, the general condition of the cars was such that car numbers were in many cases scarcely readable. Gradually, their condition was improved so that many cars now only require water and cleaning chemicals are not necessary.

Signal Board Installed

To meet safety requirements and insure proper handling of the cars, a signal board was installed ahead of the first washing station. The board has a red, a yellow and a green light with appropriate printed designations. The green light means that brushes are retracted and that the train shall proceed. This is done to permit movement of cars over the washer track which do not require washing. The yellow light indicates that the train is to be moved forward until the front end of the first car is even with the last brush of the first washing station. On a signal from the field man, the brushes are swung against the cars, are put in rotation, and the sprays turned on. The train then moves through the washer. The red light means that the brushes are against the sides of the car and there is no side clearance. It has been found possible to clean about 50,000 cars with one set of brushes.

An additional benefit made possible by the use of the washer, is the cleaning of hoppers. Previously, it was necessary for one man to hold a container under the hopper, while a second worked inside, and then to carry the container to a sewer where the contents could be disposed of. Now, the hoppers are washed and dumped as the car goes over the car washing stand, and the deck, which drains into a sanitary sewer and is flushed down at intervals with a hose.

The signaling and operating procedures described, meet all sanitation and safety requirements.



A touch-up man on each side works between the two washing stations

The Locomotive Traction Generator Comes of Age

(Continued from page 106)

practices, however, have never been and probably never will be universally accepted by the industry.

Progress in Design

The first commercial Diesel-electric locomotive in the United States was built in 1925, but as of that date the design proportions of the traction generators had not departed very greatly from those used in industrial practice. During the following ten-year period a 3 to 1 reduction in weight per kva. of continuous rating was accomplished as indicated by the data of Fig. 5. This enormous technological advance was due in part to the engine builders' increase in the horsepower output and speed of their prime movers, but to a much greater extent it was the result of the efforts of the electrical industry in developing the highly specialized designs of generators according to the principles that we have been discussing. Although the designs of locomotive generators were frozen during World War II, the curve of progress is seen to have flattened out to a great extent even before the war period. Since the war, the curve has taken a new dip toward still lower weight per kva. This second, though materially smaller, advance is again due in part to the availability of higher speed, higher hp., prime movers and in part to the electrical industry's further improvements in insulations, excitation systems, and motor control techniques for road locomotive application.

Conclusion

In the sixty year old electric-traction industry, the twenty-two year old locomotive traction generator is a comparative youngster but on reaching maturity, it has assumed a role of major importance. Business in these generators in 1948 promises to exceed that of 1947, with a probable production of 2,500,000 hp. There has been striking progress in design through the years and the future holds promise of further interesting developments with a continuing trend toward higher speed, higher horsepower, and still more output per pound or per cubic foot.

NEW DEVICES

Complete Automatic Air-Conditioning Controls

A fully automatic control system for heating, ventilating, and cooling in railroad passenger cars, which relieves trainmen of responsibility other than to turn a switch knob on a control

and cooling of a car requires no further attention.

This system is now in operation on two modernized 14-roomette sleeping cars and ten new first-class coaches of the Canadian Pacific. Similar controls are being installed in five new bedroomette sleeping cars, and in a number of new sleepers and new coaches for the same line. First installed on the modernized roomette sleeping cars four years ago, the system is said to have demonstrated its ability dependably to assure passenger comfort. Because of the relatively few components and the simplicity of their arrangement, initial costs for labor, parts, piping, and wiring are said to have been comparatively low for the existing installations. Specified temperatures

service. Temperature boundaries of each phase are as specified by the railroads. The temperatures stated below are those specified for the Canadian Pacific cars. Other, and quite different, temperature specifications may be met by the system as desired.

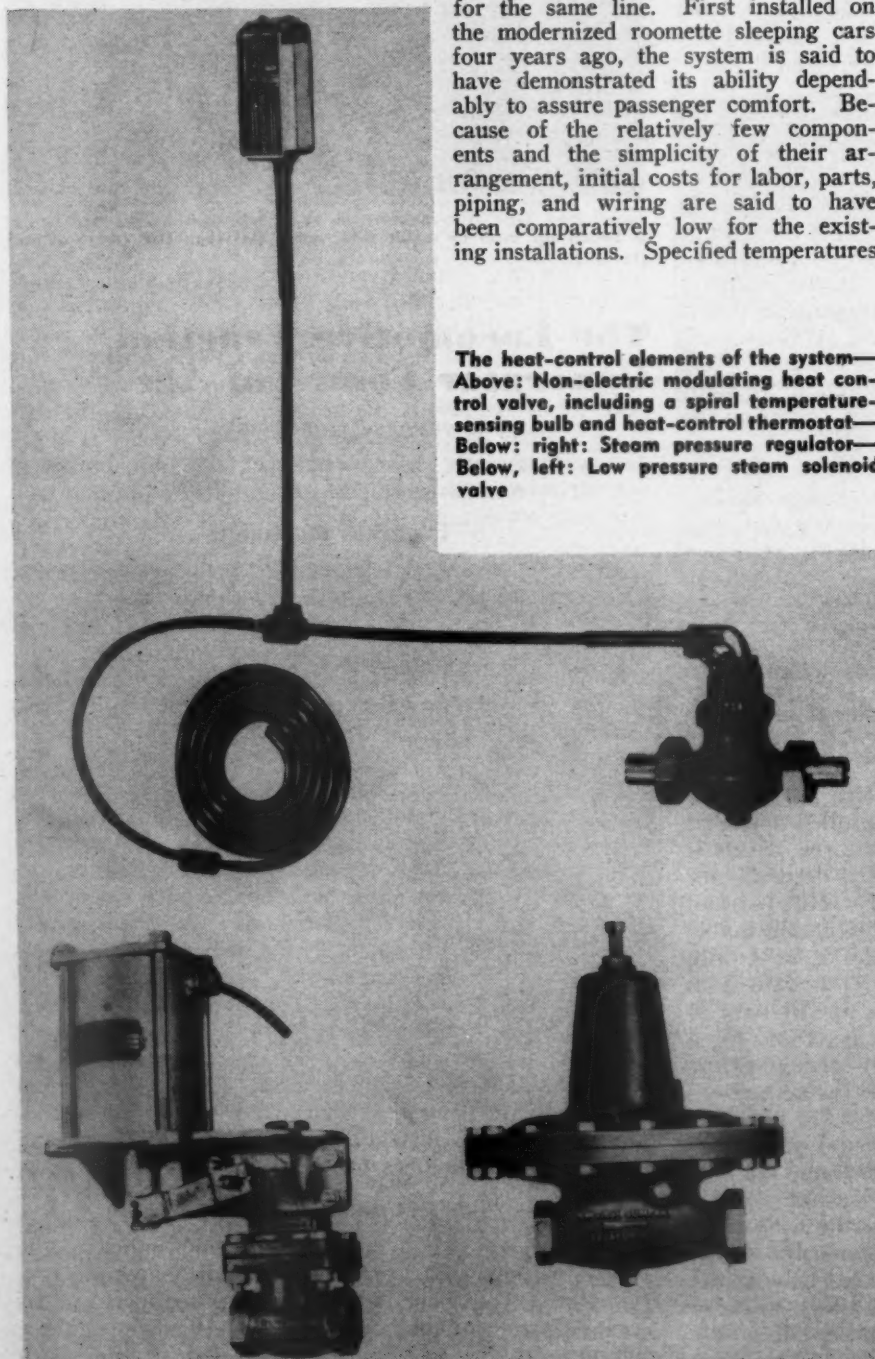
The first phase is automatic modulated heating control, which, in the Canadian Pacific cars, continues as long as interior temperatures average below 71 deg. F. and exterior temperature is below 69 deg. F. The second phase is automatic ventilating without heating or cooling, which starts when interior temperatures average above 71 deg. F. and exterior temperature is above 69 deg. F. Automatic ventilating (the operation of blower and exhaust fans while overhead heating and cooling coils are cut off) continues as long as interior temperatures average between 71 deg. F. and 73 deg. F. The third phase is automatic cooling. This may be electro-mechanical or other conventional cooling means, and functions when car temperature rises above 73 deg. F. and outdoor temperature is above 69 deg. F.

Heating Control

During the heating phase steam from the train line passes through a strainer and regulator at each steam-supply loop, to enter the heating system in the car body at 10 lb. per sq. in. The heating demand is handled by overhead heating coil and floor convectors, which work in combination to furnish varying amounts of heat input to the car while in revenue service.

The steam enters an overhead heating coil and the several finned floor convectors through non-electric modulating valves with temperature-sensing bulbs. These modulating valves control the admission of low-pressure steam at rates determined by space temperatures, outdoor temperatures, and control adjustment settings. Control valves for overhead coil and floor convectors are identical in type, but those for the overhead heat control are of greater capacity than the floor valves.

The self-operated temperature-control valves do not cycle from open to closed, but are true modulators, which control the flow of steam by throttling it to balance closely the heat losses. The quantity of steam passing through the valves is determined by the amount of variation between car-space temperature and the chosen temperature control value. Differences cause corresponding internal temperature-pressure changes in a liquid-vapor-filled valve-actuating system. Modulating-valve operation is not affected by variations in steam-supply pressure, due to a compensating (balancing) bellows contained in each valve body. The temperature-sensing bulb for each floor heat



The heat-control elements of the system—
Above: Non-electric modulating heat control valve, including a spiral temperature-sensing bulb and heat-control thermostat—
Below: right: Steam pressure regulator—
Below, left: Low pressure steam solenoid valve

panel, has been announced by the Instrument Division of Thomas A. Edison, Inc., West Orange, N.J. As long as steam, electric power, and coolant are available, the heating, ventilating

are maintained with an overall accuracy of 1 deg. to 1½ deg. F.

Generally speaking, the Edison system is divided into three phases of fully automatic operation in normal

zone is located where convenient, often on the underside of a seat or on a shoe box. No electrical power is used in connection with these valves.

Comfortable space heating is selected by rotating a calibrated dial in the control adjustor. Inside the adjustor is a bellows on which compressive action is imposed or relieved when the dial is rotated, changing the volumetric capacity and internal pressure of the actuating system of the modulating valve.

The temperature control adjustor of the modulating valve for the overhead heating coil is normally limited to permit an operating span of 20 deg. F., but may control through a range of 40 deg. F. Both the adjustor and the temperature-sensing bulb are mounted in an assembly which is placed in the air duct on the downstream side of the overhead heating coil. Blower and exhaust fans remain in operation continuously and handle air to all car spaces as long as the system is set up for fully automatic control.

Public spaces are zoned. Each zone is comfort-controlled by a separate modulating valve with adjustor and temperature-sensing bulb. The adjustors of the modulating valves that control heating in the various zones of public spaces are pre-set by yard personnel within a range of 5 deg. F. and are shielded to minimize tampering with the control setting.

In room-type cars, each room is a separate heating zone maintained by floor and overhead heat input. The occupant of such private space may select the temperature desired within an adjustable span at 20 deg. F. to control floor heat delivery to that space.

Two solenoid steam valves, controlled through electrical thermostats, are installed under the car in the low-pressure line downstream from the regulator. Their duty is to prevent steam from entering the car body during the cooling and ventilating phases of automatic operation and to maintain car temperature at the desired level during parking periods through the cycling of a separate electrical parking thermostat. These solenoid valves are normally open and pass steam only when the electrical thermostat contacts are open and the solenoid is de-energized.

A heat-failure thermostat stops the blower and exhaust fans should steam supply fail when outside temperature is low, thus preventing rapid cooling of the car interior. As soon as steam is again available, the blower and fans are restarted automatically. Should the diaphragm of a steam pressure regulator rupture and permit high-pressure steam to pass through the regulator, an adjacent low-pressure combination trap and relief valve would immediately bleed the high-pressure steam to the atmosphere. It could not enter the car body.

Even should there be complete failure of electrical power, properly controlled warmth is automatically maintained from the floor convectors, whether a car is running or parked, as long as there is adequate steam in the train line. This is, of course, because the auto-

matic modulating control valves are non-electric and the steam solenoid valves are open when de-energized. This feature and careful attention to trapping

cooling are used, with cooling control adapted to the recommendations of the suppliers of the cooling equipment.

Temperature-sensing devices for the cooling phase are rugged, sensitive bi-metallic electrical thermostats, sealed in glass, which close contacts on rising temperature. These electrical thermostats are unaffected by voltage changes, hence require no fixed series resistances. They are rated at one ampere, but operate at considerably below that current. They also operate in any position and under extreme vibration. In use, these thermostats close or open contacts according to space temperature and operate heavy-duty equipment through magnetic relays on the control panel.

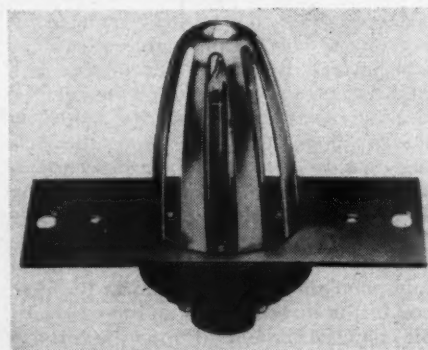
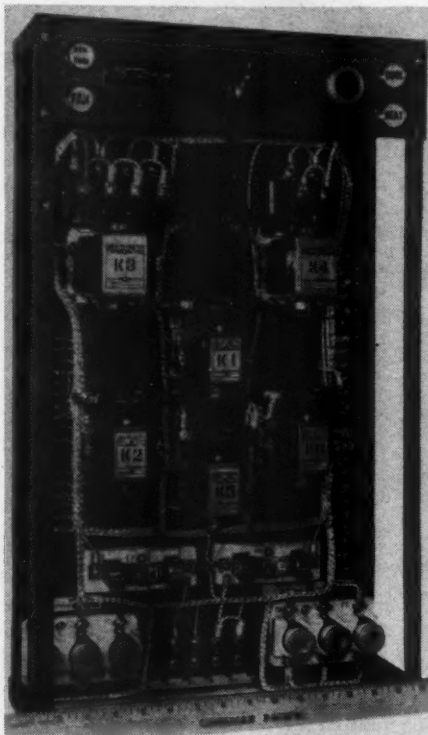
Cooling control is divided into two stages: reduced cooling for moderate cooling demands and full cooling for heavy demands. Reduced cooling involves the cutting off of coolant to one-half of the evaporator coil or coils and reduction of compressor speed for electro-mechanical systems, and involves the reduction of blower speeds for ice-activated systems. Full cooling simply means that, for electro-mechanical cooling compressor and evaporator operate at full capacity, and for ice-activated cooling, the blower operates at full speed.

There can be automatic cycling between full cooling and reduced cooling just as between reduced cooling and ventilating, or ventilating and heating phases. It is impossible, however, for any interference to exist between the heating and cooling phases.

Electrical Features

Because the automatic modulation control valves that are used for floor and overhead heating are non-electric, a single small electric control panel is adequate for the entire system. This panel has a polished, transparent front cover through which all panel details are plainly visible. Major panel items are front-of-board mounted and may be readily removed and replaced without removal of the panel. Each electrical component is used well below its rating. All heavy-duty circuits are protected by thermal-type fuses. The maximum power consumption of this system is under 175 watts, regardless of car layout.

The Edison system uses a basic wiring and piping layout, which may be adapted for application to all passenger-car types, both new and modernized. This simplifies maintenance and trouble shooting. The arrangement of the system is such that there is a simple division of responsibility for maintenance and repair between electricians and steamfitters. The relatively few different types of parts which make up the system reduce the number of inventory items necessary to protect maintenance replacements. Electrical equipment failures due to short circuits or continuous overloads are reduced by the use of thermal delay fusing and the operation of all electrical equipment at well below rated capacity.



Top: Electrical elements of the system—Electrical control panel for mechanical cooling—The switch at the top center is set for complete automatic control—The pilot lights to the left and right of the switch indicate in which phase the system is operating—Below: Shielded bi-metallic electrical thermostat, sealed in glass

results in minimum escape of steam to the atmosphere.

Automatic Ventilation

The automatic ventilating phase consists merely of the operation of blower and exhaust fans while the heating and cooling functions are both cut off. In borderline cases, the system will cycle slowly and automatically between heating and ventilating phases, or between ventilating and cooling phases. The ventilating phase is, in effect, a buffer region between the heating and cooling phases of the control system.

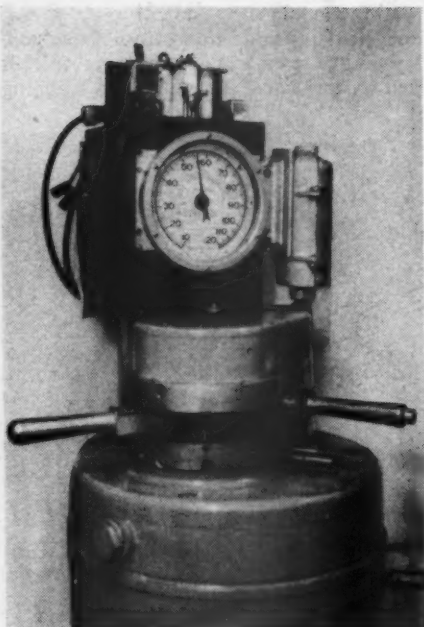
Cooling Phase

In the Edison control systems already installed or under construction, both electro-mechanical and ice-activated

Diesel-Electric Locomotive Operation Recorder

The Valve Pilot Corporation, New York 17, has developed a Diesel locomotive operation recorder as a means for improving locomotive performance and as an aid in bettering the engine-men's operating skill. The instrument has as its foundation the Valve Pilot mechanical speed recorder that has been in use for many years.

The instrument records speed and may incorporate all movements of the transition and dynamic braking lever, throttle lever, and reverse lever. As the tape used in the Diesel locomotive operation recorder is approximately two inches wide it is important that the number of written records be kept within reasonable limits to avoid confusion in analyzing the graphs produced. For that reason one pencil has been designed to record the movements of two controls wherever possible. The five independent records are made by three pencils. One pencil charts the speed; the second pencil makes both the transition and dynamic-braking records, and the third shows throttle and reverse-lever movements. A fourth pencil can be installed to indicate the forestalling



The Diesel-electric locomotive operation recorder mounted at the control stand

of restrictive train-control signals on railroads using this type of signalling.

The movement of the pencil recording the speed is actuated by the rotation of a drive connected to the end of a locomotive axle. The motion is transmitted by a link shaft through a compensating gear box, located between the axle and the instrument, which makes it possible to correct for errors caused by wheel tread wear. Either one or two cam boxes, depending on whether the transitions are recorded, are bolted to the cab floor near the base of the control stand. The cam boxes occupy a space approximately 10 in. by 9 in. by 3 in. The pencil recording the movements of the throttle lever and the reverse lever has a mechanical push-pull cable hookup through a cam in the cam box to the throttle lever and moves with the changes in the position of the throttle lever. When the reverse lever is moved to the back-up position the throttle fulcrum block is moved in the cam box and the throttle record is produced on a different part of the tape, thus identifying back-up moves of the locomotive.

The transition and dynamic-braking recording pencil is actuated by a similar cam and cable arrangement connected to the transition and dynamic braking

lever. Transitions are recorded in steps as horizontal lines at the miles per hour at which each transition should be made. Dynamic braking can be indicated for those railroads employing this Diesel-electric locomotive feature.

The Diesel locomotive operation recorder can be designed for use with various types of Diesel-electric locomotives as built by the several manufacturers. The instrument is made in four types for 0-60, 10-90, 10-100 and 10-120 m.p.h. operation. However, where the transition record only is required the 10-120 m.p.h. instrument is used.

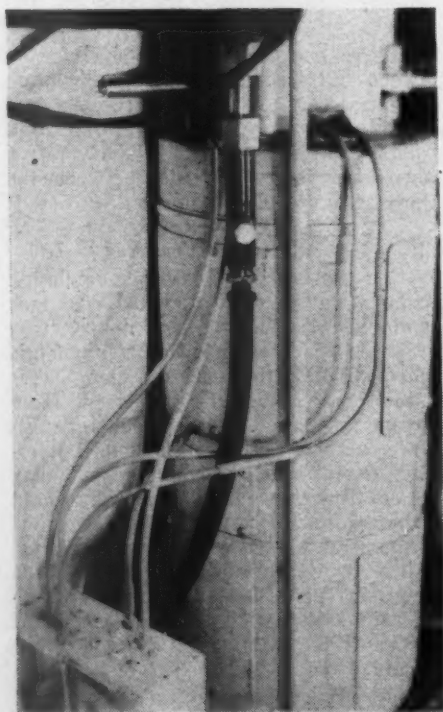
Improved Snubber Spring

Improvements in design to give greater ruggedness and longer life have been incorporated in the Style A-7 Volute Snubber Spring, manufactured by the Holland Company, 332 South Michigan avenue, Chicago. The number of working parts has been reduced from three to two—the volute spring, which provides the snubbing effect through friction between the surfaces of the spring coils, and the spring base. A bolt and a rubber plug hold the two working

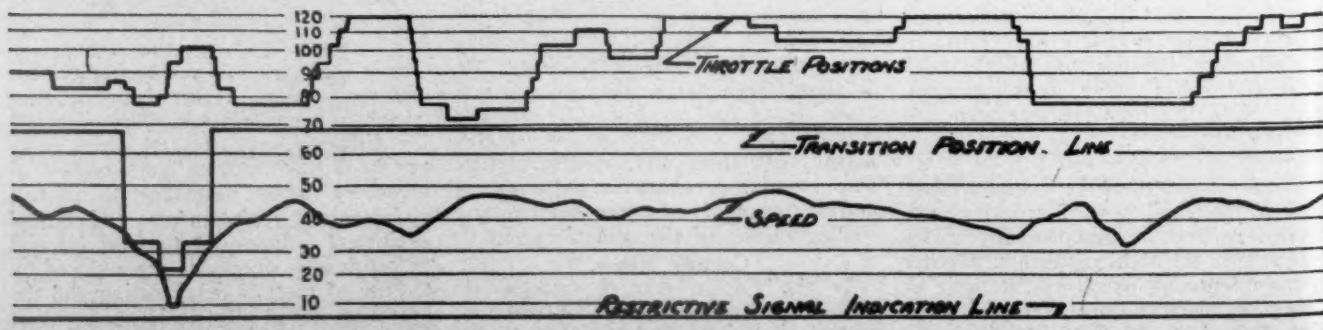


Holland style A-7 volute snubber Spring

parts together so that the spring can be handled and applied as a single unit. The style A-7 is stressed lower than previous designs. The volute spring of this snubber has been increased in diameter and utilizes the entire space available in the spring group, making possible an increase in the friction surface area. The spring bar is wider and thicker, giving the spring greater vertical and lateral stability.



Above: Connections between the cambox and the recorder—Below: Reproduction of an actual tape section from a Diesel-electric freight locomotive having the manual transition



NEWS

Coordinated Associations Meet September 20—Chicago

The Coordinated Mechanical Associations—Air Brake Association, The Car Department Officers' Association, Locomotive Maintenance Officers' Association, Master Boiler Makers' Association, and the Railway Fuel and Traveling Engineers' Associations—will meet at the Hotel Sherman, Chicago, for three days, September 20, 21 and 22. A joint session of all the associations will open the three-day meeting on Monday, September 20, at which J. H. Aydelott, vice president, Association of American Railroads, will make the principal address. No general exhibit will be held this year in connection with these meetings. The five associations will then hold separate sessions at which the following addresses, individual papers, and committee reports, will be presented:

Master Boiler Makers' Association

Monday, September 20
10:00 a.m.

Address by President S. E. Christopherson.
Address by C. B. Peck, managing editor, *Railway Mechanical Engineer*.
Report of the Executive Board, Edward H. Heidel (chairman).
Message by secretary-treasurer, Albert F. Stiglmeier.

Afternoon, September 20
2:00 p.m.

Joint Meeting
Topic No. 6: Benefits to be derived from Properly Cooling Down and Firing Up Locomotive Boilers. Carl A. Harper (chairman), general boiler inspector, C. C. & St. L.
Topic No. 4: What Improvements Can Be Made in the Maintenance and Inspection of Steam Locomotives to Increase Its Availability? R. W. Barrett (chairman), chief boiler inspector, C. N.

Tuesday, September 21
9:00 a.m.

Address by O. R. Barefoot, superintendent of motive power and car department, C. P.
Topic No. 1: Fusion Welding and Cutting of Alloy Steel as Used in Modern Steam Locomotive Boilers. Edward H. Heidel (chairman), general boiler foreman, C. M. St. P. & P.
Report of secretary-treasurer, Albert F. Stiglmeier.

Afternoon, September 21
1:15 p.m.

Address by E. C. Payne, consulting engineer, Consolidation Coal Company
Topic No. 2: Recommended Practices for Steam Boiler Application and Maintenance. Dr. G. R. Greenslade (chairman), director of research, Flannery Bolt Company
A—Tolerances Used with Taps and Staybolts
B—Tools Used with Threading, Gauges, etc.
C—Seal Welding of Staybolts
Topic No. 3: What Improvements Can Be Made in Water Circulation, Ash Pans, Front Ends and Brick Arches to Increase the Steaming Qualities of Steam Locomotive Boilers. Arthur Williams (chairman), vice-president, The Superheater Co.

Wednesday, September 22
9:00 a.m.

Topic No. 5: Study of the Causes For and Corrective Measures Necessary to Prevent Cracking of Boiler Shell Plates Made of Various Steels. Ray McBrien (chairman), engineer of standards and research, D., R. G. & W.
Election of officers
Executive Board Meeting

Afternoon, September 22
1:30 p.m.

Report of the Committee on Law. C. L. Combes (chairman), associate editor, *Railway Mechanical Engineer*
Report, Committee on Memorials. J. J. Desmond (chairman), boiler foreman, Washington Terminal Company
Report of Committee on Resolutions. H. W. Chandler (chairman), asst. boiler foreman, Ch., M. St. P. & P.

Railway Mechanical Engineer
AUGUST, 1948

Car Department Officers' Association

MONDAY, SEPTEMBER 20
2:30 p.m.

Address by President I. M. Peters, secretary and superintendent, Crystal Car Line, Chicago
Report on Preparation of Freight Cars to Meet Present Day Operation, by A. H. Keys, superintendent, car department, B. & O., Baltimore, Md.

TUESDAY, SEPTEMBER 21
9:00 a.m.

Address by railroad officer
Report on Interchange and Billing for Car Repairs, by R. W. Hollon, mechanical inspector, C. B. & O., Chicago
Report of Committee on A. A. R. Loading Rules, by H. L. Hewing, district general car foreman, C. M. St. P. & P., Chicago
Report on Passenger Car Heating—Operation and Maintenance, by J. R. Standley, inspector, Pullman Company, Chicago
Report on Air-Conditioning Equipment—Operation and Maintenance, by G. A. Shaffner, general supervisor, C. & N. W., Chicago

WEDNESDAY, SEPTEMBER 22
9:00 a.m.

Address by railroad officer
Report of Committee on Painting, by H. E. Kneeder, painter foreman, C. & E. I., Danville, Ill.
Report on Wheel Shop Practices, by R. L. Frame, foreman, N. Y. C., Indianapolis, Ind.
Report on Car Lubrication Practices, by F. H. Campbell, general inspector, C. M. St. P. & P., Milwaukee, Wis.
Election of officers

Railway Fuel and Traveling Engineers' Association

MONDAY, SEPTEMBER 20
2:30 p.m.

President's address
Address by a mechanical officer
Secretary-treasurer's report
Passenger-Train Handling with Electro-Pneumatic Brake Equipment
Freight-Train Handling

TUESDAY, SEPTEMBER 21
Mechanical Day
9:30 a.m.

Front Ends, Grates, Ashpans and Arches
Water Treatment for Steam Locomotives, from the Fuel Economy Standpoint
Training of Locomotive Firemen—Coal Fuel Economy in Stationary and Direct-Steam-Heating Plants
Smoke Abatement in Building Fires in Engine-houses, and Control of Smoke Out on the Road
Diesel Locomotive Operation
Operation of Steam Generator on Diesel Locomotives
Water Treatment for Diesel Locomotives, from the Fuel Economy Standpoint
Training of Locomotive Firemen—Oil

WEDNESDAY, SEPTEMBER 22
Fuel Day
9:30 a.m.

Storage Coal Handling
The Unit Cost of Coal on Locomotives
Fuel Statistics
Elections

2 p.m.

Regional Locomotive Fuel (Coal) Standards, by E. C. Payne, consulting engineer, Pittsburgh Consolidation Coal Company. Panel discussion

Locomotive Maintenance Officers' Association

Addresses:

Operating Abuses and Their Effect on Diesel Maintenance, by J. D. Loftis, chief of motive power and equipment, Atlantic Coast Line.
The Present Day Importance of Proper Steam Locomotive Maintenance, by C. B. Hitch, chief mechanical officer, Chesapeake & Ohio.

Committee Report:

A—Maintenance of Diesel Engines, Auxiliaries and Connectors and Steam Generators. Chairman: H. F. Mackey, supervisor Diesel engines, Atchison, Topeka & Santa Fe.

B—Heavy Maintenance of Electrical Equipment—Traction Motors and Generators, Control Equipment, Storage Batteries and Auxiliaries. Chairman: R. L. Fort, assistant research engineer, Illinois Central.

Committee Report:

A—Locomotive Terminal Facilities—Installation and Conversion to Modern Diesel Locomotive Servicing Facilities. Chairman: H. E. Niksch,

B—Installation of Modern Steam Locomotive Servicing Facilities. Chairman: C. E. Pond, assistant to superintendent motive power, Norfolk & Western.
General Chairman: J. T. Daley, superintendent motive power, Alton & Southern.

Committee Report:

Training of Mechanical Personnel with Diesel Specialization. Chairman: E. P. Gangewere, superintendent motive power and rolling equipment, Reading.

Committee Report:

Engine House Inspection and Maintenance of Roller Bearings. Chairman: John Whalen, shop superintendent, Missouri Pacific.

Committee Report:

Retooling Necessary as Diesel Locomotives Increase in Number. Chairman: H. H. Magill, superintendent locomotive and car shops, Chicago & North Western.

Air Brake Association

MONDAY, SEPTEMBER 20
2:30 p.m.

Opening of Air Brake Association Convention
Paper on Maintenance of AB Brakes

TUESDAY, SEPTEMBER 21
9:00 a.m.

Fundamentals of Braking

11:00 a.m.

Load Compensating Brake

3:00 p.m.

Decelostat and Decelostat Sanding

WEDNESDAY, SEPTEMBER 22
9:00 a.m.

Mechanically-Driven Air Compressors for Diesel Locomotives—Maintenance and Testing

11:00 a.m.

Maintenance and Testing HSC Brake Equipment

3:00 p.m.

Approved Maintenance Practice

R.M.E. in Bank Exhibit of Old Newspapers

As a part of its observance of its one hundredth anniversary, the Union Square Savings Bank, New York, which was organized in 1848 as the "Institution for Savings of Merchants' Clerks," placed on exhibit originals and facsimiles of sixteen newspapers and periodicals which date from 1848, or earlier. These publications, which are still being published in New York, included several religious magazines, the *New York Sun*, the *New York Herald Tribune*, a medical journal, the *Police Gazette*, the *Scientific American*, the *Journal of Commerce*, and the *Railway Mechanical Engineer*. The latter is a direct descendant without a break in line, of the *American Railroad Journal*, a 16-page "advocate of internal improvements," which first appeared on January 2, 1832, as a weekly.

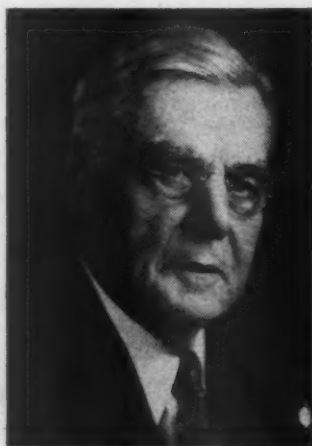
Photostatic blow-ups of news items and advertisements which appeared in the publications a century ago were also exhibited. A condensed history of each publication which could be read in a few minutes formed a part of each exhibit.

Lawford H. Fry, Locomotive Institute Director, Dies

Lawford Howard Fry, former director of research of the Steam Locomotive Research Institute, New York, died at Mount Vernon, N.Y., on July 11. Mr. Fry, who retired on July 1, was born at Richmond, P.Q., Canada, on June 16, 1873. He was educated in private schools in the United States, Canada, and England; City and Guilds of London; Technical College, London (1893); the Uni-

versity of Gottingen (1894), and Hannoverische Technische Hochschule (1894-97). He began his career in 1897 in the erecting shop of the Baldwin Locomotive Works, Philadelphia, Pa., where he became engineer of tests in 1904. Later the same year he was appointed technical representative of the Baldwin Locomotive Works in Europe. He returned to the United States in 1913 and thereafter was metallurgical engineer for the Standard Steel Works Company until 1930 when he became railway engineer for the Edgewater Steel Company, Pittsburgh, Pa. He resigned in 1943 to become director of research for the Steam Locomotive Research Institute.

Mr. Fry was an affiliated member of the Mechanical Division, Association of



L. H. Fry

American Railroads, a member of the Iron and Steel Institute, and a fellow of the American Society of Mechanical Engineers, from which he received the Worcester Reed Warner Medal in 1938 for "written contributions relating to improved locomotive design and utilization of better materials in railway equipment." He also served on the Executive Committee of the American Society for Testing Materials. He was a member of the Institution of Mechanical Engineers, the Institution of Civil Engineers, and the Institution of Locomotive Engineers in England. He was also a member of the Soc. Ing. Civils de France. Mr. Fry was the author of numerous contributions to technical papers and societies and of "A Study of the Locomotive Boiler."

Miscellaneous Publications

MOLYBDENUM: STEELS, IRONS, ALLOYS. By R. S. Archer, J. Z. Briggs, and C. M. Loeb, Jr. Published by the Climax Molybdenum Company, 500 Fifth avenue, New York 18. 391 pages, illustrated with diagrams and charts. For distribution only to metallurgists and others closely connected with the metallurgical industries. The varied applications of molybdenum as an alloying element are described in this book which covers a wide range of materials from wrought to cast steels and from cast iron to non-

ferrous alloys. Major emphasis has been placed on the presentation of the fundamentals that must guide all engineers, designers, and metallurgists in their selection of the most suitable materials for

a given application. An attempt has also been made to show the fields of similarity and dissimilarity of the various materials and to indicate some of the factors that may affect the choice of the most

Orders and Inquiries for New Equipment Placed Since the Closing of the July Issue

Road	No. of locos.	Type of loco.	Builder
Atchison, Topeka & Santa Fe.....	10	1,000-hp. Diesel-elec. switch.	Baldwin Locomotive
Chesapeake & Ohio.....	25 ¹	2-6-6-2 Mallet	Baldwin Locomotive
Great Northern.....	5 ²	6,000-hp. Diesel-elec. frt.	Electro-Motive
	2 ³	3,000-hp. Diesel-elec. pass.	Electro-Motive
	1 ⁴	4,500-hp. Diesel-elec. frt.	Electro-Motive
	2 ⁵	3,000-hp. Diesel-elec. frt.	Electro-Motive
	2 ⁶	1,500-hp. Diesel-elec. pass.	Electro-Motive
Minneapolis, Northfield & Southern.....	5 ³	2,000-hp. Diesel-elec. transfer	Baldwin Locomotive
Missouri-Kansas-Texas.....	2 ⁴	4,000-hp. Diesel-elec. pass.	American Locomotive
Missouri Pacific.....	10 ⁶	4,500-hp. Diesel-elec. frt.	Electro-Motive
	9 ⁶	3,000-hp. Diesel-elec. frt.	Electro-Motive
	11 ⁶	1,000-hp. Diesel-elec. switch.	Baldwin Locomotive
	4 ⁶	1,500-hp. Diesel-elec. road switch.	Baldwin Locomotive
	4 ⁶	4,000-hp. Diesel-elec. pass.	American Locomotive
	7 ⁶	1,000-hp. Diesel-elec. switch.	American Locomotive
Southern Pacific.....	30 ⁸	6,000-hp. Diesel-elec. frt.	Electro-Motive
	40 ⁸	1,000-hp. Diesel-elec. switch.	Electro-Motive
	15 ⁸	1,500-hp. Diesel-elec. road switch.	Baldwin Locomotive
	10 ⁸	70-ton switchers	General Electric
Union Railroad.....	7 ⁷	1,500-hp. Diesel-elec. transfer	Baldwin Locomotive

FREIGHT-CAR ORDERS

Road	No. of cars	Type of car	Builder
Alabama Great Southern.....	150 ⁸	Gondolas	Pressed Steel
Atchison, Topeka & Santa Fe.....	750 ⁸	50-ton box	Company shops
Chicago & North Western.....	50 ¹⁰	70-ton gondola	Pressed Steel
	19 ¹⁰	70-ton covered hoppers	General American
Clinchfield.....	500	50-ton hopper	American Car & Fdry.
Delaware, Lackawanna & Western.....	300	50-ton box	Magor Car
	200	50-ton box	Pullman-Standard
	100	70-ton covered hopper	American Car & Fdry.
Louisiana & Arkansas.....	100 ¹¹	70-ton covered hopper	General American
Nashville, Chattanooga & St. Louis.....	500	50-ton hopper	Pullman-Standard
Missouri Pacific.....	500	50-ton gondola	Pullman-Standard
	1,000	70-ton hopper	Bethlehem Steel
	1,000	70-ton hopper	Company shops
Norfolk & Western.....	1,000 ¹³	70-ton hopper	Virginia Bridge
Seaboard Air Line.....	500	50-ton PS-I box	Pullman-Standard
	50	50-ton gondola	Pressed Steel
Western Maryland.....	200 ¹³	50-ton box	Pressed Steel
	50 ¹³	70-ton gondola	Pressed Steel
	200 ¹³	70-ton gondola	Greenville Steel Car

FREIGHT-CAR INQUIRIES

Road	No. of cars	Type of car	Builder
Delaware & Hudson.....	100	70-ton covered hopper	
Delaware, Lackawanna & Western.....	50	50-ton hopper	
Illinois Central.....	3,000	50-ton hopper	
	375	50-ton flat	
	100	70-ton covered hopper	
St. Louis-San Francisco.....	700	50-ton hopper	
Seaboard Air Line.....	200	70-ton covered hopper	
	150	70-ton coal	
	100	70-ton covered phosphate-rock hopper	

PASSENGER-CAR OWNERS

Road	No. of cars	Type of car	Builder
Delaware, Lackawanna & Western.....	10	Coaches	Pullman-Standard
	10	Coaches	American Car & Fdry.
Southern Pacific.....	30 ¹⁴	Sleeping	Budd Company
	20 ¹⁴	Chair	Budd Company
	6 ¹⁴	Baggage-mail	Budd Company
	6 ¹⁴	Dining	Budd Company
	6 ¹⁴	Lounge	Budd Company
	5 ¹⁴	Dormitory	Budd Company
	5 ¹⁴	Coffee-shop-lounge	Budd Company

¹ To cost approximately \$5,000,000. Delivery scheduled to begin next January.

² The delivery of these locomotives, which will cost over \$5,000,000, is expected in October. The two 1,500-hp. passenger locomotives will be added to two 2,700-hp. Diesels now in service, making two three-unit locomotives of 4,200-hp. each.

³ Delivery of these locomotives, which will cost approximately \$1,000,000, is scheduled for October and November.

⁴ These two new Diesels were ordered as a result of the rearrangement of an order for freight Diesels placed by the Katy as reported in the February issue of the *Railway Mechanical Engineer*, page 110. Under the rearranged order, the American Locomotive Company will build, in addition to the two locomotives just mentioned, nine 3,000-hp. freight locomotives, and the Electro-Motive Division of the General Motors Corporation will build four 4,500-hp. freight and four 3,000-hp. freight locomotives. The first of the new Diesels is to be delivered next November, with all deliveries being completed during 1949.

⁵ Two of the 4,500-hp. freight locomotives and four of the 3,000-hp. freight locomotives to be built by Electro-Motive and two of the 1,000-hp. switchers to be built by Alco are for the International Great Northern. The St. Louis, Brownsville & Mexico will receive four of the Electro-Motive 3,000-hp. freight locomotives, the four Baldwin 1,500-hp. switchers, and six of the Baldwin 1,000-hp. switchers.

⁶ Delivery expected to begin at the end of this year.

⁷ With six-wheel trucks and six motors.

⁸ To cost approximately \$850,000. Delivery expected the first part of 1949.

⁹ Delivery scheduled to begin the fourth quarter of 1948.

¹⁰ Delivery of the gondola cars is scheduled for next December and delivery of the covered hopper cars is expected during the first quarter of 1949.

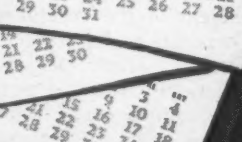
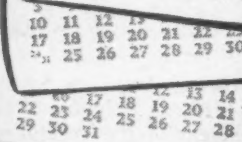
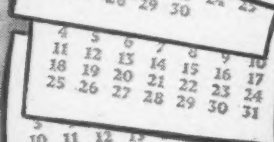
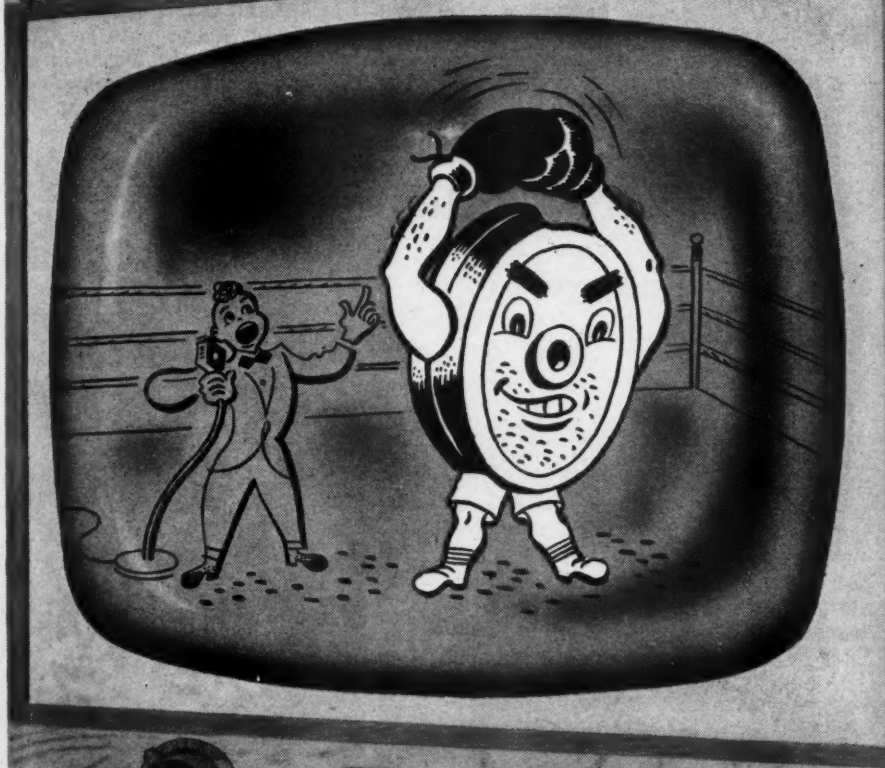
¹¹ Delivery scheduled for next December or January.

¹² Deliveries scheduled to begin early in 1949.

¹³ The gondola cars to be built by Pressed Steel are scheduled for delivery during the fourth quarter of 1948, and those to be built by Greenville will be delivered in the first quarter of 1949.

¹⁴ This equipment, together with the nine Diesel-electric locomotives recently ordered from the American Locomotive Company, will be used to make up five new "Sunset Limited" trains for daily service between New Orleans, La., and Los Angeles, Calif. Delivery of the cars is expected to begin the latter part of next year.

FAR TOUGHER IN



THAN IN '38



The Chilled Car Wheel of today is a much Tougher than the wheel of ten years ago. AMCCW research has brought about spectacular advances in chill control and service characteristics. The sum total of these advances marks a hard-to-believe improvement.

Unspectacular hard work in metallurgical laboratory and testing departments has played its part in making these wheels better. Flanges and rims have

been made notably stronger as a result. New machines and new equipment for testing are now serving the AMCCW research staff. Yet, many established techniques are retained, such as the use of the hydraulic press in measuring static flange strength.

Once a new standard has been set, each AMCCW member is helped in carrying it out by the Association's resident inspector and its traveling general inspectors and supervisors.



ASSOCIATION OF MANUFACTURERS OF CHILLED CAR WHEELS

445 NORTH SACRAMENTO BOULEVARD, CHICAGO 18, ILL.

American Car & Foundry Co. • Canadian Car & Foundry Co. • Griffin Wheel Co.
Marshall Car & Foundry Co. • New York Car Wheel Co. • Pullman-Standard Car Mfg. Co.
Southern Wheel (American Brake Shoe Co.)

economical material for making a specific part.

Technical Effects of Molybdenum, Fundamental Effects of Heat Treatment on Microstructure; Addition of Molybdenum, Wrought Alloy Engineering Steels, Wrought Corrosion-Resistant Steels, Wrought Steels for Elevated Temperature Service, Tool Steels, Steel Castings, Cast Iron, and Special Purpose and Non-Ferrous Alloys are the main section headings. Information is included not only on such recent developments as the gas-turbine steels and alloys, but also on the work that has served to clarify

the factors affecting the service life of the lower alloy steels. References are given to current literature for more detailed data. Information has also been compiled on such applications as exhaust valves, elevated temperature springs, ferritic gas-turbine steels, high permeability alloys, contact materials, grid wires, and prosthetic alloys. In the appendices are data on standard compositions of American, British and French engineering steels, working stresses from the Boiler Code, conversion tables, and the physical properties of metallic molybdenum.

STAINLESS PLATES (SOLID AND CLAD) AND THEIR FABRICATION. Allegheny Ludlum Steel Corporation, Public Relations Department, Pittsburgh 22, Pa. 32-page booklet, illustrated, contains late and authentic information on the selection and fabrication of solid stainless-steel and stainless-clad plates, whether used alone or in combination with each other. Tables and charts show available sizes, thicknesses and weights, etc. There are sections on analysis, selection, shop work, cutting, machining, forming, welding, annealing, etc., also A.S.T.M. plate specifications.

Supply Trade Notes

UNION ASBESTOS & RUBBER CO.—*Norman C. Naylor*, vice-president and a director of the American Locomotive Company, with headquarters at Chicago, who retired on June 30 after 50 years of service with that firm, has been elected a vice-president of the *Union Asbestos & Rubber Co.* at Chicago. Mr. Naylor continues as a director of Alco.

ALLEGHENY LUDLUM STEEL CORPORATION.—*H. N. Arbuthnot*, assistant to the president of the Allegheny Ludlum Steel Corporation, has been transferred from Detroit, Mich., to Washington, D. C., where he will serve as representative of the company and its president in relationships with the various governmental agencies. Mr. Arbuthnot, who will also assume the duties of manager of sales in the District of Columbia area, succeeds *A. Wilbur Mace*, who has retired. *Truman B. Brown*, former assistant manager of cutting and tool-steel sales, with offices in Pittsburgh, Pa., has been appointed assistant district manager of sales for the Detroit, Mich., territory. *Roger S. Ahlbrandt*, former district manager of sales for the Pittsburgh territory, succeeds Mr. Brown. *Max J. Pischke*, former manager of

warehouse and jobber sales, has been appointed district manager of sales for the Pittsburgh territory succeeding Mr. Ahlbrandt.

H. N. Arbuthnot joined Allegheny Steel Company in 1926 as manager of sales in the Detroit territory. When Allegheny and Ludlum Steel were merged in 1938, he retained that position which also involved supervision of warehouse sales. He was transferred to Pittsburgh as assistant general sales manager in 1942, and, when the company acquired its Carbide Alloys Division in 1944, he returned to Detroit as regional manager. He was appointed assistant to the president in 1946.

SCULLIN STEEL COMPANY.—*Torsten H. Parke*, *Bransford W. Grenshaw*, and *Herbert F. Blattner*, formerly sales representatives of the Scullin Steel Company, have been appointed assistant vice-presidents. Mr. Parke is in charge of the company's New York office. Mr. Grenshaw, who is in the St. Louis, Mo., office, will transfer to the Chicago office, and Mr. Blattner will remain in the St. Louis office.

NATHAN MANUFACTURING COMPANY.—*Arthur Wilkins* has been appointed vice-president in charge of production of the Nathan Manufacturing Company to succeed *John D. Spaulding*, resigned.



R. Welsh

Richard Welsh, western manager for the Nathan Manufacturing Company, has retired.

Richard Welsh was born in Clinton,

Alco Production Now 100 Per Cent Diesel-Electric

Steam locomotive production came to a halt at the Schenectady, N.Y., plant of the American Locomotive Company on June 16 after the completion of the 2-8-4 type for the Pittsburgh & Lake Erie illustrated. Alco's Schenectady facilities are now devoted completely to the manufacture of Diesel-electric locomotives. During the past 100 years, it is said, the company produced approximately 25,000 steam locomotives. "American Locomotive is not intentionally going out of the steam locomotive business," P. T. Egbert, vice-president in charge of the locomotive division, said. "It is simply a matter of demand. All orders and inquiries for new motive power from domestic railroads are for Diesel-electrics. We have been preparing for this day for a number of years and have invested more than \$20,000,000 to convert our facilities. . . . It is estimated that our Diesel-electric production this year will be 150 per cent of that for 1947." Mr. Egbert added that considerable steam locomotive space will be "mothballed" to meet any future demand, domestic or foreign, for steam locomotives.



AD)
eny
ela-
32-
late
lec-
ess-
ther
each
able
ere
hop
eld-
late

NY.
ted
of
to
ed.



Steam trains are making 2,000,000 miles a day



While the spotlight of public attention naturally falls on newest developments, it is sometimes well to back off and take a look at the overall picture.

We're thinking of the steam locomotive. These locomotives are making better than two million train-miles today—and will do it again tomorrow and the next day. They—these steam locomotives—are producing more revenue ton-miles right now than ever before in peacetime history.

Many of these locomotives are old, too old, and have distorted the statistics on performance. Many, however, are modern. And on modern steam power—locomotives that pack 5000 to 9000 horsepower and can stay on the road for 16 and 18 hours, and then turn around in an hour or two—the statistics look pretty good.

We build such modern power—and are convinced that it has its place.



DIVISIONS: Lima, Ohio — Lima Locomotive Works Division; Lima Shovel and Crane Division. Hamilton, Ohio — Hooven, Owens, Rentschler Co.; Niles Tool Works Co.

PRINCIPAL PRODUCTS: Locomotives; Cranes and shovels; Niles heavy machine tools; Hamilton diesel and steam engines; Hamilton heavy metal stamping presses; Hamilton-Kruse automatic can-making machinery; Special heavy machinery; Heavy iron castings; Weldments.

Iowa, and began his railroad career as a fireman on the Chicago & North Western at Camden, Neb. He joined Nathan Manufacturing in 1915 as a service engineer in Chicago and was appointed western manager five years later.

SIMMONS - BOARDMAN PUBLISHING CORPORATION—*John G. Little*, assistant to vice-president, Simmons-Boardman Publishing Corporation, at Cleveland, Ohio, since 1928, retired on June 1. Mr. Little was born in North Chemung, N. Y., on September 14, 1881. He entered railroad service with the Erie in September, 1902, serving successively as track-



John G. Little

man, rodman and transitman and, from 1903 to 1905 as assistant engineer at Hornell, N.Y. In 1906 he joined the Delaware, Lackawanna & Western as assistant engineer at Binghamton, N.Y. In 1908 he was transferred to Buffalo, N.Y., as assistant engineer. Mr. Little entered the employ of Simmons-Boardman in June, 1916, as eastern engineering editor of the *Railway Age Gazette*, now *Railway Age*, and associate editor of *Railway Engineering and Maintenance*. In December, 1924, he was appointed special representative for Simmons-Boardman at Cleveland, and, in 1928, assistant to vice-president.

DAMPNEY COMPANY OF AMERICA.—The *Curtiss Johnson Company*, Houston, Tex., and *Woodward Wight & Co.*, New Orleans, La., have been appointed sales representatives for the Dampney Company of America.

CARNEGIE-ILLINOIS STEEL CORPORATION.—*J. Douglas Darby* has been elected sales vice-president of the Carnegie-Illinois Steel Corporation, a subsidiary of the United States Steel Corporation, to succeed *Thomas J. Hilliard*, resigned.

J. Douglas Darby began his business career as a slagman with the Alan Wood Steel Company and advanced through various positions in his 20 years' service there to become general superintendent and later assistant to sales vice-president. He joined the sales department of Carnegie-Illinois in 1939 and, in the same

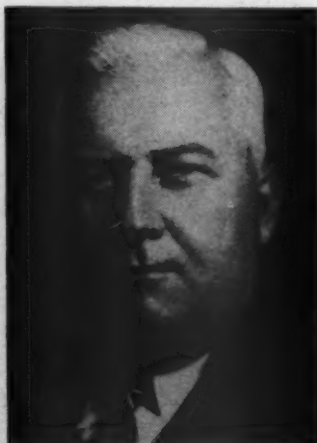


J. D. Darby

year, was appointed district manager of sales in Philadelphia, Pa. In 1945 he was transferred to Pittsburgh, Pa., as general manager of sales for the company.

AMERICAN LOCOMOTIVE COMPANY. *William E. Corrigan*, vice-president of American Locomotive Company, has been placed in charge of sales of the Locomotive Division including direction of all sales activities of district sales offices. Mr. Corrigan will have offices in Schenectady, N.Y., and will also maintain an office in New York. The office of vice-president of Eastern Regional sales, formerly held by Mr. Corrigan, has been abolished.

William E. Corrigan began his Alco career in 1909, when he started a four-year study in locomotive construction at the company's Schenectady, N.Y., plant. In 1915 he was transferred to the company's former plant at Paterson, N.J., as assistant engineer. He entered the Army in 1917, attaining the rank of captain, and after the war became ordnance district chief and chairman of the Claims Board of the Rochester Ordnance District, in charge of settlement of war



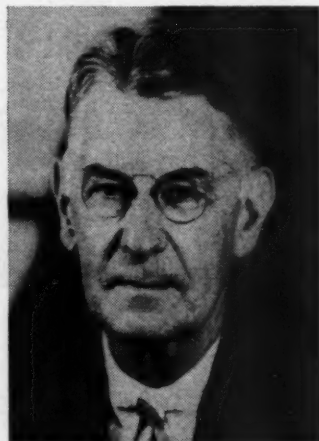
W. E. Corrigan

contractors' contract-cancellation claims in New York State. He rejoined Alco in 1920 in the New York Sales office. He was appointed district sales manager for the Pacific Coast at San Francisco in 1923 and at Cleveland in 1930. He

was appointed assistant vice-president in charge of Alco's Railway Steel Spring Division in 1935 and in 1937 became vice-president of sales of that division. During World War II he served as vice-president in charge of miscellaneous munitions and Diesel Engine Division, Contract Cancellations. Afterward he became vice-president of Eastern Regional Sales.

LUKENS STEEL COMPANY.—*F. H. Gordon*, vice-president of the Lukens Steel Company, Coatesville, Pa., has retired.

Mr. Gordon joined the sales depart-



F. H. Gordon

ment of the concern, then known as Lukens Iron & Steel Co., in 1895. In 1903 he was appointed assistant general sales agent and, in 1907, general sales agent. He was elected a vice-president in January, 1928.

THOMAS A. EDISON, INC.—*William J. Savage* has been appointed director of sales for the primary battery division of *Thomas A. Edison, Inc.*

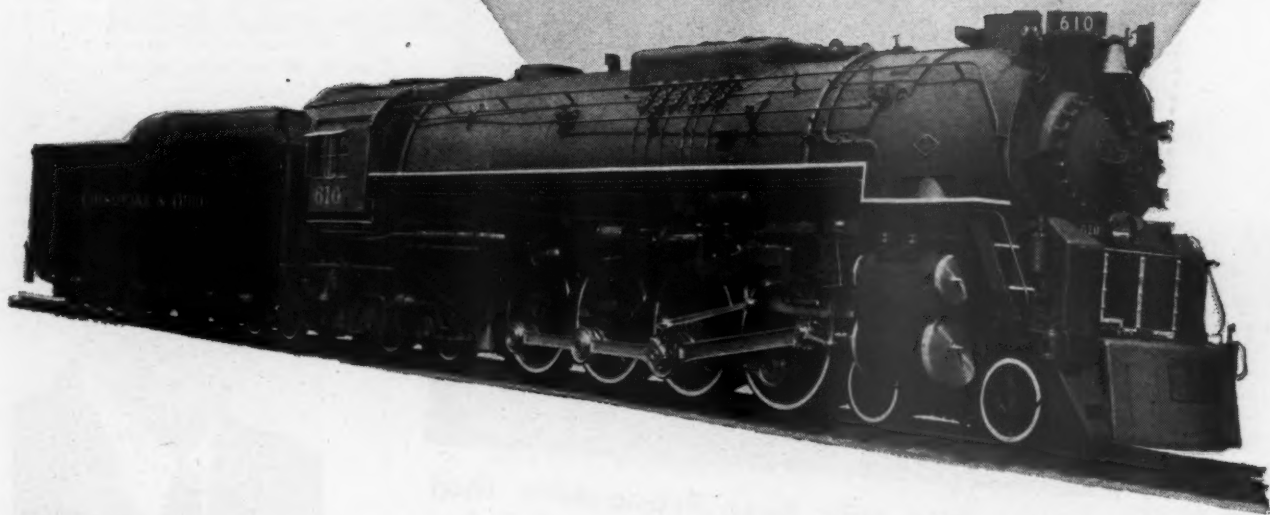
Mr. Savage was born in Waterbury, Conn., on April 29, 1896. He joined the primary battery division of the Edison company as a tester in 1915 and successively advanced to foreman, service engineer, sales engineer and southeastern sales manager. In July, 1941, he was appointed eastern sales manager. In his new position, Mr. Savage will coordinate all divisional sales activities, including general direction of the home district.

DEARBORN CHEMICAL COMPANY.—*F. E. Rolston* has been assigned by the *Dearborn Chemical Company* to the territory previously covered by *Tom Holcombe*. Mr. Rolston will be in charge of the sale of all the firm's products in Louisiana, Arkansas, and a part of eastern Texas. He will temporarily be located at the Shreveport, La., office.

WHITMAN & BARNES DIVISION, UNITED DRILL & TOOL CORP.—Contracts have been awarded for the construction of a complete new plant for the Whitman & Barnes Division of the United Drill & Tool Corp. at 40600 Plymouth Road, Plymouth, Mich. The plans in-

81,800 lb. *Tractive Effort*

FOR PASSENGER SERVICE!



THE Chesapeake and Ohio believes in starting passenger trains fast. This takes tractive effort. And they know, from their experience with more than 200 other Booster-equipped locomotives, that the Booster will give them the extra power needed for prompt get-away.

Consequently the five 4-8-4's being delivered by Lima-Hamilton this month — as well as other new and recently modernized C & O locomotives — are equipped with Boosters. These 4-8-4's have an initial tractive effort of 81,800 lbs. — about the highest we know of for strictly passenger service. The Booster provides 12,400 pounds — or 18% of the starting effort of the main engine.

**Equipped
with
Boosters®**



FRANKLIN RAILWAY SUPPLY COMPANY

A CORPORATION

NEW YORK • CHICAGO • MONTREAL

**STEAM DISTRIBUTION SYSTEM • BOOSTER • RADIAL BUFFER • COMPENSATOR AND SNUBBER • POWER REVERSE GEARS
AUTOMATIC FIRE DOORS • DRIVING BOX LUBRICATORS • STEAM GRATE SHAKERS • FLEXIBLE JOINTS • CAR CONNECTION**

For Maintenance Savings . . .

STOP RUST

with

RUST-OLEUM



It's the Scientific Rust Preventive that Checks Rust by Water, Brine, Smoke, Heat, Weather, Uremic Acid, Etc.

Here's How RUST-OLEUM Saves Labor and Money Less Preparation Time

- No sandblasting, flame cleaning or chemical dissolvers are necessary. Merely wirebrush to remove rust scale, dirt, etc.

- Rust-Oleum Goes on Faster
- It saves 25% on application time and covers 30% more area per gallon. Excellent coverage, millions of economy.

Enduring Protection

- Rust-Oleum outlasts ordinary materials two to ten times on most jobs, depending on conditions, under which it's used.

EASY TO USE
LASTING
SATISFACTION
APPLY BY
BRUSH, DIP OR
SPRAY



Rust-Oleum Rust Preventives can help you to achieve greater net profits by a considerable reduction in the cost of maintenance of all rustable metal surfaces. Indoors or out—wherever rust threatens—Rust-Oleum cuts losses from rust. IT CAN BE APPLIED DIRECTLY OVER RUSTING METAL—by brush, dip or spray. It's tough, elastic, weatherproof!

The use of Rust-Oleum adds extra years of service to rolling stock, bridges, metal buildings, right-of-way structures, signal equipment, tanks, towers, etc. Rust-Oleum provides lasting protection for an average of 1/2 cent a square foot per coat material cost.

Get the facts NOW. Write today for Catalog No. 145.

RUST-OLEUM CORPORATION

2419 Oakton Street

Evansville, Illinois

clude a single-story building, 360 ft. by 630 ft., for the manufacture of twist drills, reamers, and other cutting tools, and a two-story office building. The project was announced in conjunction with the one hundredth anniversary celebration of Whitman & Barnes.

WESTINGHOUSE ELECTRIC CORPORATION.—*Russell E. Ebersole* has been appointed general manager of lamp sales for the Westinghouse Electric Corporation to succeed *William J. Massey*, who has retired after 50 years with the lamp division. *Harold G. Cheney* has been appointed assistant manager of lamp sales.

LINK-BELT COMPANY.—The Link-Belt Company plans the construction of a new plant in Houston, Tex. The new building will occupy a 10-acre plot and contain approximately 45,000 sq. ft. of floor space.

R. H. SHEPPARD COMPANY.—*Fred D. Livingston*, former general sales manager of the R. H. Sheppard Company, has been appointed vice-president. *Spencer A. Ware*, who previously served in

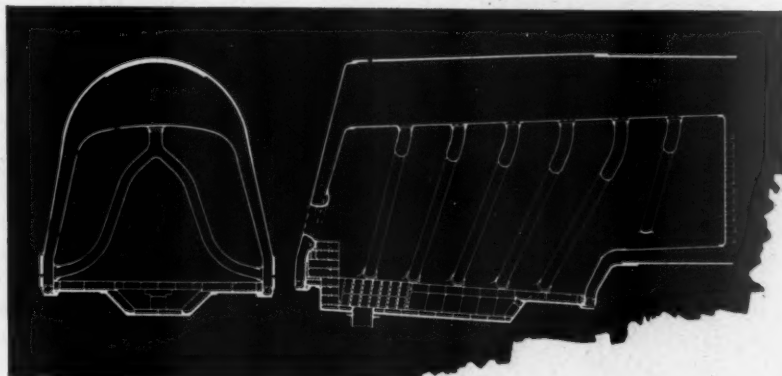


F. D. Livingston

executive capacities with the Chrysler Corporation and Willys-Overland, succeeds Mr. Livingston as general sales manager.

ORTNER COMPANY.—The *Ortner Company*, Terrace Plaza building, Cincinnati, Ohio, a new concern has purchased all the assets of the *Railway Accessories Company*, and will engage in the purchase, repair, conversion and sale of all types of railroad equipment and also act as a sales agency for a number of railroad supply manufacturers. *J. L. Ortner*, president of the new company, was born in Bennington, N. Y., on November 29, 1893. He entered railroad service in 1911 and until 1933 was successively an apprentice, car inspector, travelling car inspector, superintendent of scrap and reclamation (stores department) and superintendent of shops for the Erie. Mr. Ortner then became vice-president of Railway Accessories. Other officers of

Giving 4-8-4 Oil Burners the advantages of Security Circulators



In the modernization of many oil-burning locomotives, they are being equipped with Security Circulators. The arrangement of circulators shown in the sketch—five in the firebox and one in the combustion chamber—is designed expressly for a class of 4-8-4 oil-burners.

Located right in the path of the hot gases, Security Circulators are very effective elements for speeding evaporation. There is a continuous circulation of water from the side water-legs, through the Circulators, over the top of the crown sheet.

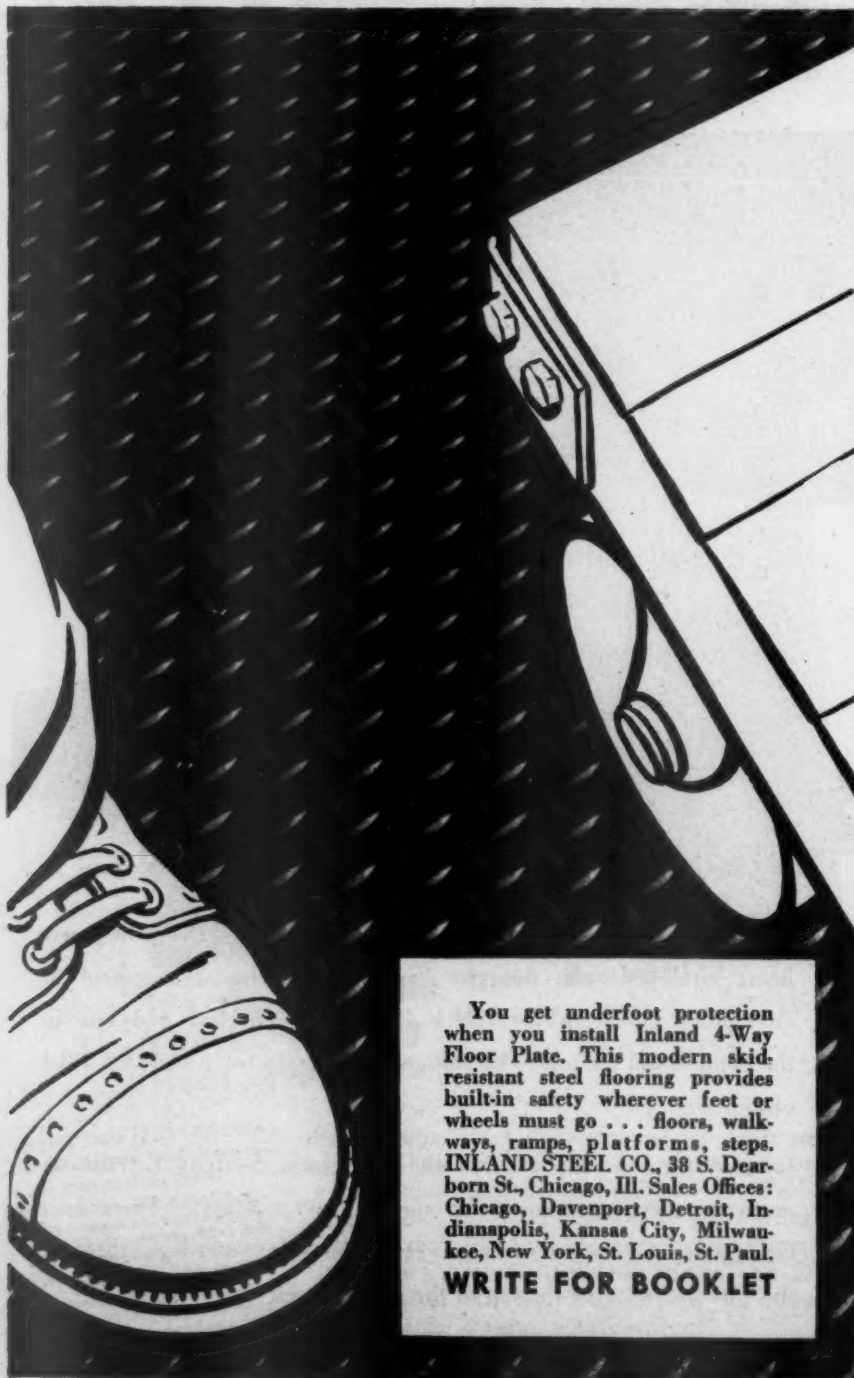
AMERICAN ARCH COMPANY, Inc.

NEW YORK • CHICAGO

SECURITY CIRCULATOR DIVISION

Safe Movement

OF MEN AND MATERIALS



You get underfoot protection when you install Inland 4-Way Floor Plate. This modern skid-resistant steel flooring provides built-in safety wherever feet or wheels must go . . . floors, walkways, ramps, platforms, steps. INLAND STEEL CO., 38 S. Dearborn St., Chicago, Ill. Sales Offices: Chicago, Davenport, Detroit, Indianapolis, Kansas City, Milwaukee, New York, St. Louis, St. Paul. **WRITE FOR BOOKLET**

INLAND

Stocked by Leading
Steel Warehouses

4-WAY FLOOR PLATE

124 (464)

the Ortner company are: *J. L. Ortner, Jr.*, vice-president; *R. C. Ortner*, secretary and treasurer, and *L. J. Ortner*, eastern representative, with headquarters in Buffalo, N. Y.

SYMINGTON-GOULD CORPORATION.—*Peter F. Rossmann*, formerly assistant to the president of the Curtiss-Wright Corporation, has been elected president of the Symington-Gould Corporation to succeed *J. A. Sauer*, who has retired. Mr. Sauer continues as a member of the board of directors and as chairman of the finance committee.

PULLMAN-STANDARD CAR MANUFACTURING Co. *George A. Huggins*, has been appointed general manager of the Pullman-Standard Car Manufacturing Company's car works plant at Chicago.

Obituary

WALTER LEWIS CONWELL, whose death on May 27 was reported in the July issue, had been president of the Safety Car Heating & Lighting Co. since 1919. He was born in Covington, Ky., on January 25, 1877, and received his higher education at the University of Pennsylvania. In 1908 he joined the Tennis Construction Company, railroad contractors, as chief engineer. Two years later he was employed as a salesman by the Westinghouse Electric & Manufacturing Co. From 1911 to 1916 he was president of the Transportation Utilities Company. In 1916 he was appointed assistant to the president of Safety Car Heating & Lighting. He was elected president of the firm in 1919, also president of the Vapor Car Heating Company, Chicago, and in 1928 president of the Vapor Car Heating Company of Canada. In 1945 he was elected chairman of the boards of the two Vapor Car companies. At the time of his death, Mr. Conwell was also a director of the Pintsch Compressing Company, the Wilcolator Company, the Carrier Corporation and Seatrain Lines, Inc.

Personal Mention

General

A. MCGREGOR, mechanical engineer in the car department of the Canadian National at Montreal Que., has been appointed mechanical engineer, Western region, with headquarters at Winnipeg, Man.

W. H. BRUENING, master mechanic of the Kansas City Southern at Pittsburg, Kans., has been appointed assistant superintendent of Diesel equipment at Pittsburg.

THOMAS PATRICK IRVING, engineer of car construction of the Advisory Mechanical Committee for the Chesapeake & Ohio, has retired. Mr. Irving was born at Susquehanna, Pa., in February, 1883, and is a graduate of Laurel Hill

Railway Mechanical Engineer
AUGUST, 1948

Academy at Susquehanna (1901) where he majored in mechanical and architectural drawing. He began his railroad career in July, 1901, as a mechanical draftsman, locomotive and car, for the Erie at Susquehanna. In 1902 he was transferred to Meadville, Pa., and from August 1, 1902, to January 1, 1928, held such positions as draftsman, assistant



J. P. Irving

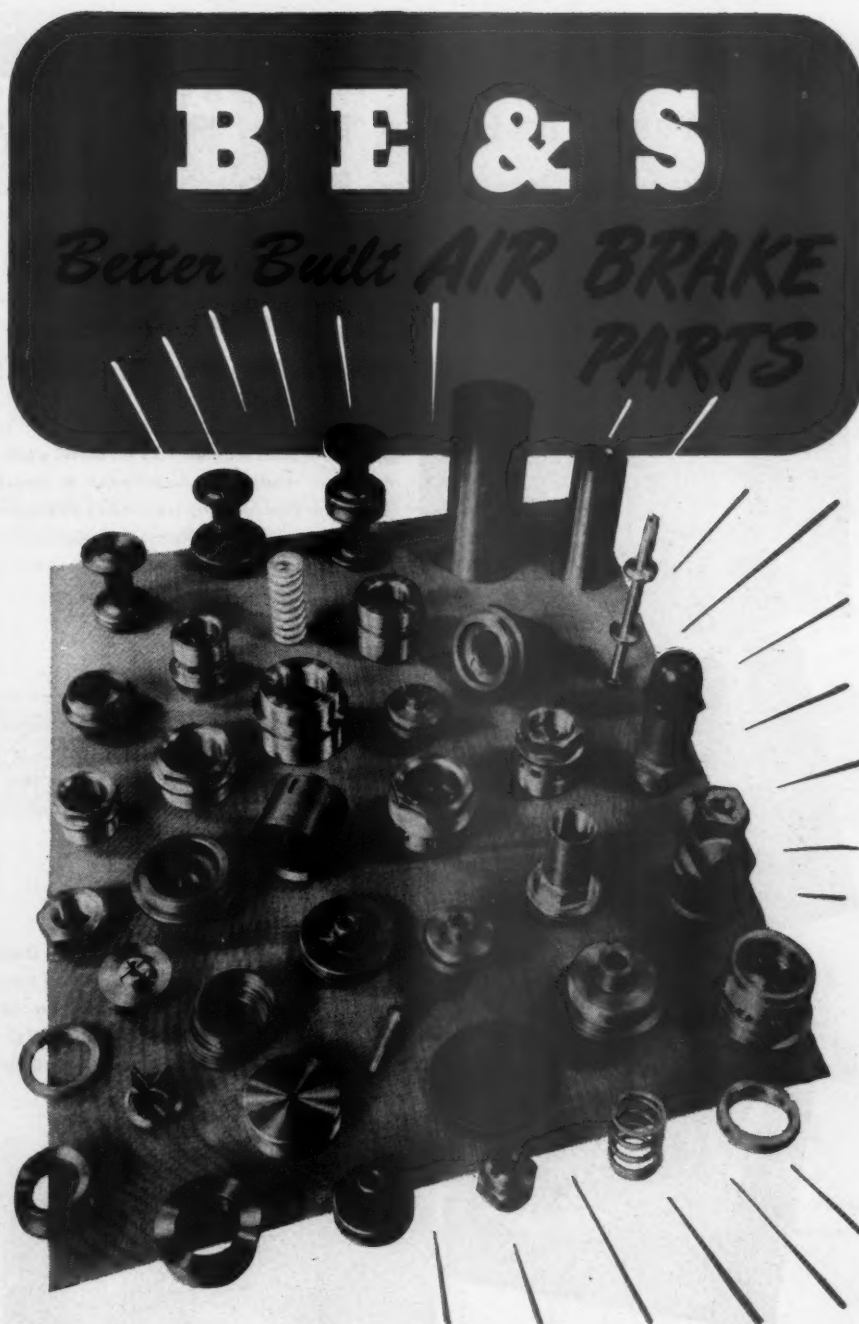
chief draftsman, chief draftsman, and assistant mechanical engineer. He was transferred to Cleveland as an Erie employee and in November, 1929, when the Advisory Mechanical Committee was organized, he was appointed engineer of car construction for the Erie, C. & O., Pere Marquette, and Nickel Plate. During World War II Mr. Irving served briefly on the War Production Board at Washington, D. C. He has been chairman of the Car Construction Committee, Mechanical Division, Association of American Railroads, since 1941 and is a member of several A.A.R. special committees.

RUSSELL GOULD has been appointed acting superintendent of power of the Sacramento Northern, with headquarters at Sacramento, Calif.

G. E. WEBB, assistant chief material inspector of the Southern at Alexandria, Va., has been appointed assistant engineer of tests at Alexandria.

FREDERICK J. HERTER, mechanical engineer of the Pere Marquette at Grand Rapids, Mich., has been appointed engineer of car construction of the Advisory Mechanical Committee of the Chesapeake & Ohio, with headquarters at Cleveland, Ohio. Mr. Herter was born at New Bergen, Pa., on June 2, 1890. He received his education through public and correspondence schools and is a graduate of Tri-State College, Angola, Ind., where he received his B.S. in E.E. in 1917. He entered railroad service in 1912 as a car repairman in the employ of the Pennsylvania at Renova, Pa. On November 1, 1918, he became a draftsman in the mechanical department of the New York, Chicago & St. Louis at Cleveland; on November 1, 1922, chief draftsman and on July 1, 1925, engineer rolling stock. On December 1, 1929, he

Railway Mechanical Engineer
AUGUST, 1948



BE&S standard air brake repair parts are more than mere duplicates of the original parts. They are *improved* duplicates. Although accurately gauged to size, BE&S parts are improved in quality of material and workmanship, and, in many cases, of improved design. Constantly on the alert for better ways of making air brake parts, BE&S engineering and research has originated improvements that are now standard on many roads. Keep in touch with us—we can help you effect important economies in your air brake department.

Brake Equipment & Supply Division

H. K. PORTER COMPANY, Inc.

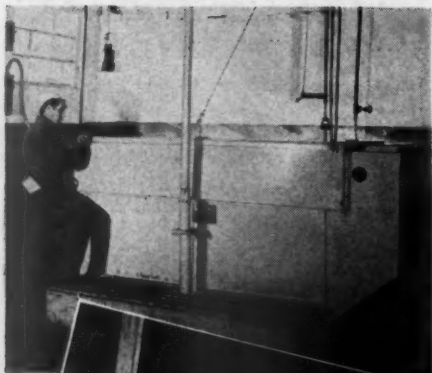
Chicago 38, Ill.

Pittsburgh 22, Pa.

District Offices in Principal Cities

MAGNUS AJA-DIP CLEANING MACHINES

**More Than Pay Their Way
on Railroad Parts!**



**Here's the Story
on Four Shops
Where They Pay Dividends!**

← Used with Magnus 755 on diesel parts. Parts are ready for reinstallation in about 1/4th the time formerly required in still tanks with ordinary solvents. Hand work eliminated.



← Used with Magnus 92-SM on all engine parts except electrical. Shows a 70% saving in time and a 10% increase in cleaned parts over steam guns formerly used.



← Used with Magnus Heavy Duty Cleaner in place of boil-out vat. Cleans without hand work in 45 minutes loads that used to take six to eight hours plus plenty of elbow grease.

Used with Magnus Heavy Duty → Cleaner in place of a still tank. Cleans over a ton of parts in an 8-hour shift where old methods took 36 hours.



You can cut cleaning time, labor and overall costs with the Magnus Aja-Dip Machine. Ask for details on your output!

MAGNUS CHEMICAL COMPANY

77 South Ave., Garwood, N. J.

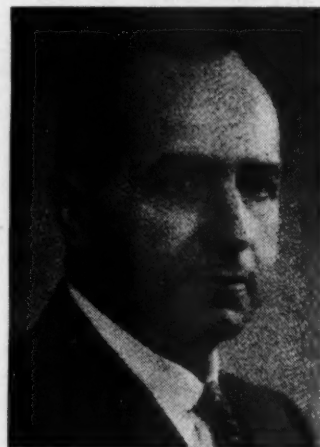
IN CANADA — MAGNUS CHEMICALS, LTD.

4040 Rue Masson, Montreal 36, Que.

Service representatives in principal cities.



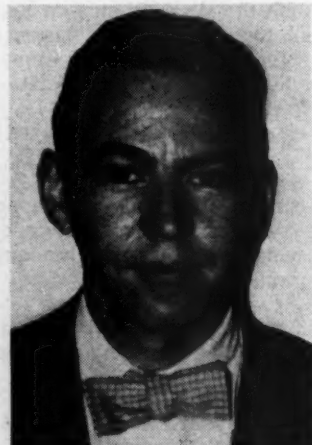
was appointed assistant engineer car construction, Advisory Mechanical Committee, C. & O., at Cleveland. He was placed on the staff of the vice-president of the C. & O., in charge of car work, on June



F. J. Herter

1, 1933, and on July 13, 1936, was appointed mechanical assistant (cars) to chief mechanical officer. On February 1, 1943, he went to Grand Rapids, Mich., as mechanical engineer of the Pere Marquette.

L. S. CRANE, assistant engineer of tests of the Southern at Alexandria, Va., has been appointed engineer of tests. Mr. Crane was born on September 7, 1915, at Cincinnati, Ohio. He received his B.S. in engineering from the George Wash-



L. S. Crane

ington University at Washington, D.C., and entered the service of the Southern on May 24, 1937, as a laboratory assistant at Alexandria. He subsequently served as a chemist and as a material inspector until October, 1943, when he became assistant chief material inspector. In July, 1946, he was appointed assistant engineer of tests.

R. H. BEVERLEY, engineer of tests of the Southern at Alexandria, Va., has retired after 48 years of service. Mr. Beverly was born at Fauquier County, Va. He is a graduate of Virginia Polytechnic Institute (1900). His service with the Southern began in 1901 at Alexandria as an inspector. He was sub-

DOING A TIMETABLE JOB!

FIVE General Motors Diesel locomotives which are assigned to the proud job of hauling the new Empire Builders on the 1,784-mile Great Northern run between St. Paul and Seattle amassed a total of 2,902,502 miles between April 1945 and October 1947.

These 4000 H.P. locomotives met their assignments better than 98%

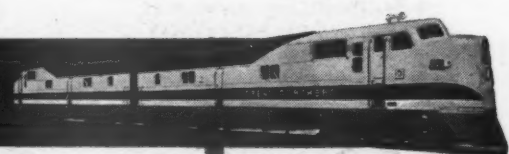
of the time — maintaining high-speed schedules with plenty in reserve and with a remarkable on-time record through all kinds of weather.

It is evident that locomotives such as these don't just happen. Behind General Motors Diesels stand years of pioneering and research—the most

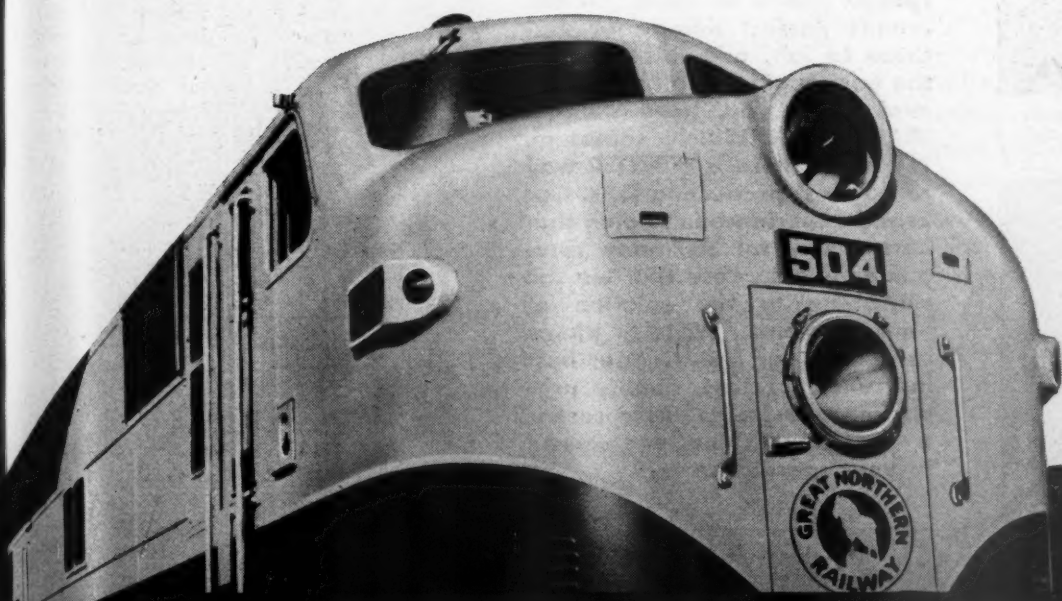
complete and modern manufacturing facilities in the industry — and the experience gained in more than a billion unit miles of operation on the railroads.

Fourteen years of mainline service, with constant improvement, have proved them to be the most reliable, efficient and economical locomotives that ever rode the rails.

GM DIESEL PERFORMANCE RECORD ON THE GREAT NORTHERN



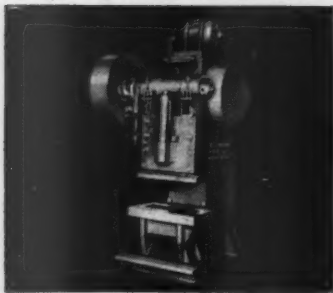
Loco. No.	Loco. Months Service	Total Miles Operated	Aver. Miles Operated Per Month	Percent Availability ★
500	30	598,909	19,964	98.5
501	30	597,928	19,931	98.6
502	29	566,357	19,530	98.8
503	29	573,072	19,761	98.2
504	29	566,236	19,525	98.6
TOTAL	147	2,902,502	19,745	98.5



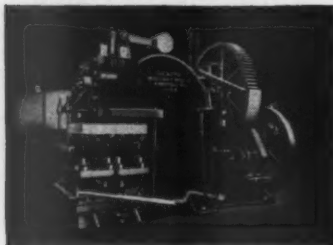
★ Availability determined on basis of hours worked to hours assigned.

G M
LOCOMOTIVES

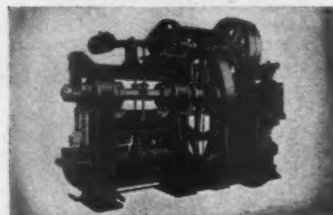
ELECTRO-MOTIVE DIVISION
GENERAL MOTORS
LA GRANGE, ILL.
Home of the Diesel locomotive



BEATTY Single End Punch available in capacities up to 200 ton.



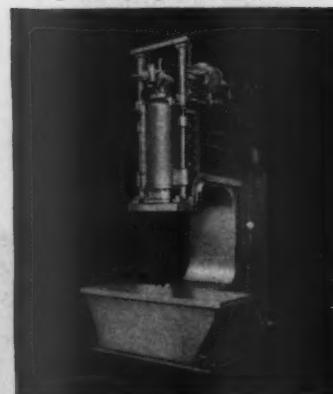
BEATTY No. 11-B Heavy Duty Punch for production tooling and use with BEATTY Spacing Table.



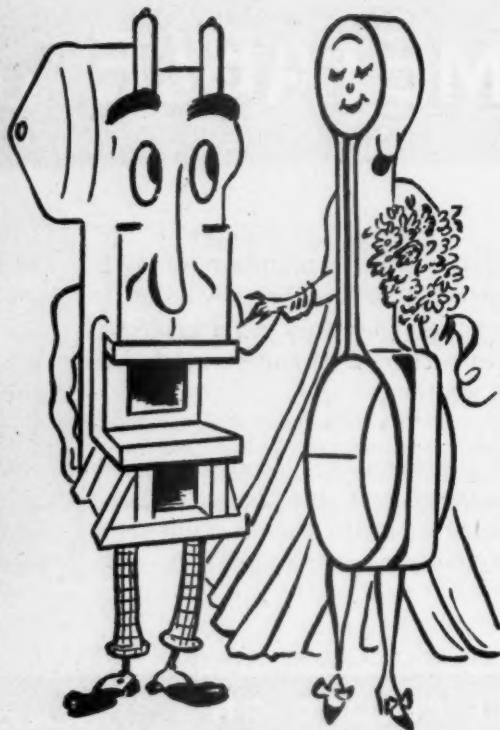
BEATTY Co-Pun-Shear — one unit does coping, punching, shearing.



BEATTY Horizontal Hydraulic Bulldozer for heavy forming, flanging, bending.



BEATTY 250-ton Gap Type Press for forming, bending, flanging, pressing.



SHOTGUN WEDDING

Fast, low-cost production today demands machines correctly designed, correctly tooled for the specific job to be done. It demands perfect mating of machine to job, and this calls for the best engineering experience available to you. Here is where BEATTY ENGINEERING comes in. We know there is a BETTER way to do most production jobs. Our broad experience in finding that better way for so many companies is assurance that we can contribute to the solution of your problems. Write or phone us about your needs. Your best insurance for fast, quality production at a competitive cost is a BEATTY machine engineered to your specific needs.



BEATTY MACHINE AND MFG. COMPANY
HAMMOND, INDIANA

sequently chief inspector and assistant engineer of tests, being appointed engineer of tests in October, 1943.

M. B. Dowdy, chief mechanical inspector of the Norfolk Southern at Norfolk, Va., has been appointed assistant to chief mechanical officer, with headquarters at Norfolk. Mr. Dowdy was born on January 6, 1917, in South Norfolk, Va. He began his career as an apprentice in the employ of the Norfolk



M. B. Dowdy

Southern and, upon the completion of his apprenticeship, was assigned to the air-brake department. On January 1, 1944, he was appointed to the position of chief mechanical inspector which has now been abolished.

VERN C. GOLDEN, general mechanical assistant of the Chicago, Indianapolis & Louisville, has been appointed superintendent of motive power and equipment, with headquarters at Lafayette, Ind. Mr. Golden was born at Whitewater, Kan., on July 27, 1903. He received his technical training at Kansas State College and in November, 1922, became an electrician in the employ of the Atchison,



V. C. Golden

Topeka & Santa Fe at Newton, Kan. He then served as a machinist and as an automatic train-control maintainer until 1935 when he became assistant supervisor of Diesel locomotives, with headquarters in Chicago. He was appointed electrical foreman in air conditioning and car lighting in May, 1938; engine-

How Long do Boxcar Floors Last?

... That depends on the type of service
they get—and the kind of floors they are.
Regardless of the service ...

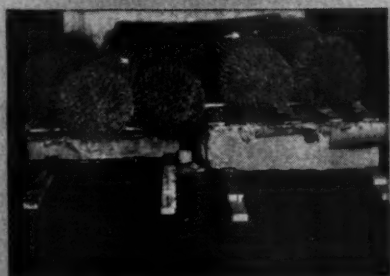
Nailable Steel Flooring* will last longer



Fork Lift Trucks are constantly breaking through wood floors now. The trend in freight handling is towards *more* and *heavier* palletized unit loads—and *more* and *heavier* trucks to handle them. There's a way to meet this trend and stop floor damage. Fork trucks *don't* break through NAILABLE STEEL FLOORING.



Nails—can't tear or splinter NAILABLE STEEL FLOORING, can't damage it in any way. Nails are held tighter in the grooves than in wood—and the *nails* are deformed, *not* the flooring.



Abrasive Freight—The grinding, scraping action of rough freight such as these granite slabs, wears and splinters wood planking. NAILABLE STEEL FLOORING has the abrasion-resistance to take it—without damage.

Nails, fork trucks, pinch bars, and abrasive freight are mainly responsible for boxcar floor damage. NAILABLE STEEL FLOORING lasts longer because it *stands up* under these wood floor destroyers.

All this adds up to a floor that's built to last as long as the car itself—that can make *major savings* in car maintenance costs. This longer life means more useful cars too, because floors will *stay* in Class A condition, suitable for all freight. For your next new car or rebuilding program—specify NAILABLE STEEL FLOORING.

*PATENTS PENDING
COPYRIGHT 1948 BY GREAT LAKES STEEL CORPORATION



GREAT LAKES STEEL CORPORATION
Steel Floor Division • Penobscot Building • Detroit 26, Michigan
UNIT OF NATIONAL STEEL CORPORATION

Wiedeke

TUBE EXPANDERS NATIONALLY KNOWN FOR
DEPENDABLE . . . ECONOMICAL *Service*



No. 40

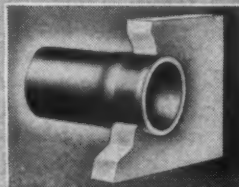
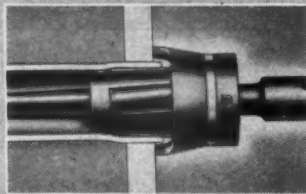
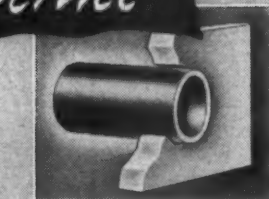
IDEAL ACE TUBE EXPANDERS

The boilermakers' selection for more than a half century, for LOCOMOTIVE and general boiler work . . . guard straddles tube and bears against tube sheet, suitable for rolling new tubes and re-rolling tubes with flared or beaded ends.

MINIMUM FRICTION . . . absorbed by bronze bearing between guard and frame, resulting in much easier and faster operation.

Long rolls have generous radius on end and will not create sharp offset within the tube.

See your dealer or write today for general catalog on Wiedeke Tube Expanders and Tube Cutters.



The Gustav Wiedeke Company
DAYTON I, OHIO

Bakes or Dries
Coils & Armatures
Automatically
NO Watching • NO Timing

- Hi-volume horizontal air flow.
- Automatic heat control.
- Positive fresh air intake.
- Controlled volatile exhaust.
- Uniform temperature.
- Economical to operate.
- Easy to load and unload.

HERE'S AN OVEN that saves time on urgent motor repair jobs. This DESPATCH S Oven reduces baking time 25 to 35%, and bakes *automatically*—without watching or timing!

Average load for this 6'x6'x6' oven is 72 armatures and 100 complete coil sets. Daily capacity is 216 armatures, 300 complete coils. Temperature: 300°F. to 450°F. Time: variable up to 6 hours—ave. 4 hours at 300°F. Direct gas fired convection heat . . . automatic, safe (Factory Mutual approved).

DESPATCH OVEN COMPANY

Minneapolis Office: 619 S.E. 8th St.

Chicago Office: 221 N. LaSalle St.

Offices in All Principal Cities

DESPATCH
OVEN COMPANY

GREAT NORTHERN Shops, St. Paul, bakes two 3-ton 36" diameter armatures for diesel-electrics in 12 hours with this DESPATCH Oven.

WRITE TODAY
for information

house foreman in 1939; and Diesel shop foreman at Chicago in 1942. He became special assistant to the general manager of the Chicago, Indianapolis & Louisville on February 1, 1947. On April 1, 1947, he was appointed superintendent of Diesel locomotive maintenance and operation, and on July 1, 1947, general mechanical assistant.

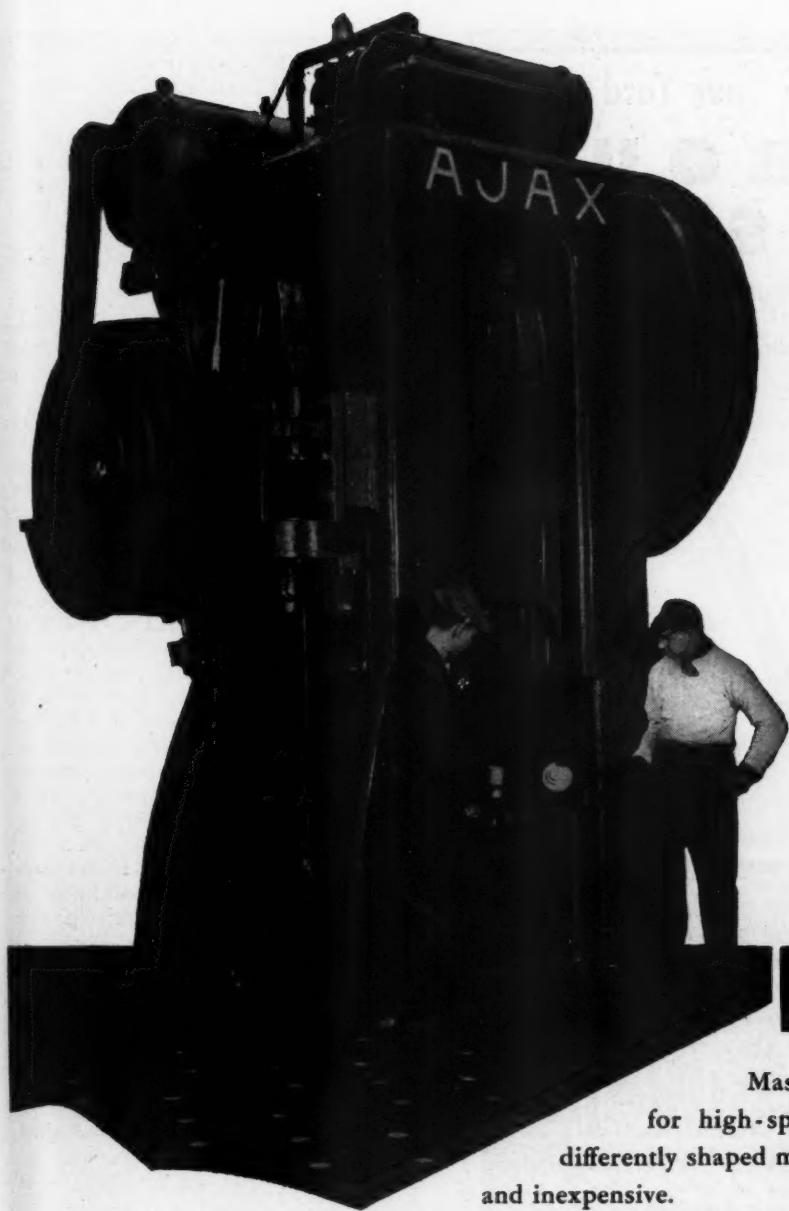
A. N. CAMPBELL, assistant chief draftsman of the Canadian National, has been appointed mechanical engineer in the car department at Montreal, Que. Mr. Campbell was born at London, Ont., where he became an apprentice carman in the employ of the Canadian National in 1933. He serves successively at London, Ont., Mimico, Toronto, Leaside, Fort Erie and Windsor, until 1941 when he became foreman at Palmerston, Ont. He moved to Toronto, Ont., in 1942 as



A. N. Campbell

an inspector, becoming assistant foreman there in 1943. The following year he was appointed mechanical inspector in the car department at Montreal and three years later, assistant chief draftsman.

D. L. KEISER has been elected president of the Texas Mexican, with headquarters at San Antonio, Tex. Mr. Keiser was born on December 10, 1876, at Boonville, Mo. He attended public schools in Rocheport, Mo., and Boonville, and is a graduate of the Specken Academy, Boonville (1896), and of the Bliss Electrical School in Washington, D.C., (1900). Immediately thereafter he entered the service of the St. Louis Street Railway Company. In 1901 he joined the Westinghouse Electric & Manufacturing Co., at East Pittsburgh, Pa., and subsequently spent two years as a special apprentice in the company's shops. He later was engaged in various electrical construction projects while associated with Westinghouse, holding posts as engineer-in-charge of construction and operation of the Derry-Latrobe Electric Company and of the electrification and operation of the Chicago, Lake Shore & South Bend (now Chicago, South Shore & South Bend). He served for a time as manager of Westinghouse's railway and lighting department at St. Louis. In 1915 he became chief engineer for the public utility company later



**press
forge
vital
parts
for**

INDUSTRY

Mass production in industry created demand for high-speed production of large quantities of differently shaped metal parts that were strong, uniform and inexpensive.

The advent and subsequent development of the Ajax High-speed Forging Press, with its high rate of continuous production of closed impression die forgings, has made forging the most advantageous means of producing a constantly widening range of these accurate, high-strength parts at low cost.

The press forging of vital parts, of simple or intricate design, from a few ounces in weight to a hundred pounds or more, for a multitude of industrial applications is the modern way—geared to straight-line production with correspondingly lowered costs.

Write for Bulletin 75-B.

THE Ajax

MANUFACTURING COMPANY
EUCLID BRANCH P. O. CLEVELAND 17, OHIO
110 S. DEARBORN ST. CHICAGO 3, ILLINOIS
DEWART BUILDING
NEW LONDON, CONN.

New Efficiency and Savings in Your Yard with

ROUSTABOUT CRANES

The fast tractor-footed load hustlers

● Wide open yard spaces that eat up profits start paying off with Roustabout Cranes on the job, loading, unloading, moving, shifting, stacking. Grab-bucket, hook or magnet, *where* you want them, *when* you want them. Engineered for years of overwork—mounted on wheel or crawler tractors. Loads to 7½ tons. Roustabout saves costly delays and manpower . . . pays for itself fast. Write for the money-saving facts today—to Dept. G-4.

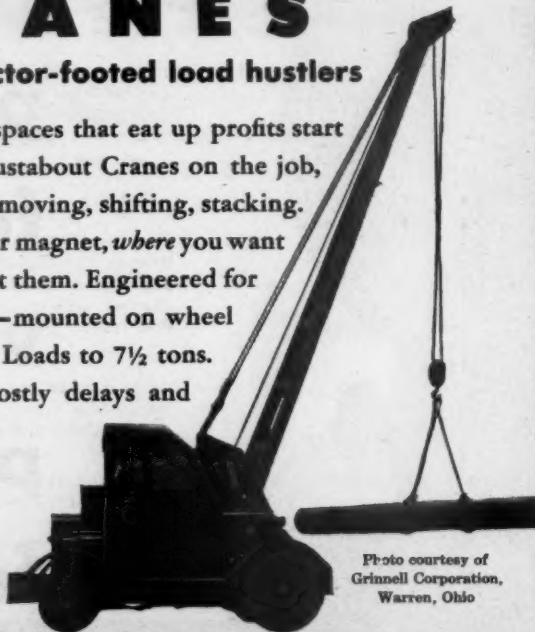


Photo courtesy of
Grinnell Corporation,
Warren, Ohio



HUGHES-KEENAN CORPORATION

MANSFIELD, OHIO, U.S.A.

Load-Handling Specialists since 1904

DURAMETALLIC

Locomotive Packings

for **STOKER
ENGINES**

Designed to give
long uninterrupted
service on all types
of locomotive stoker
engines.



STYLE
D & B-911

Durametallic Stoker Engine Packings are engineered to **KEEP CONDENSATE OUT OF THE CRANK CASE**. Supplied in die-molded ring sets ready to install in standard stuffing boxes.

On your request we will be glad to send our "Locomotive Packing Bulletin" covering various types of Durametallic Packings to meet your needs.



DURAMETALLIC
KALAMAZOO

CORPORATION
MICHIGAN

known as the Central Power & Light Co. Mr. Keiser also spent a number of years as president of a public utilities company in Mexico, which position he held until he joined the Texas Mexican. He became vice-president of the road—with the full responsibility for converting its motive power from steam to Diesel-Electric—and was serving in that post at the time of his recent election as its president.

J. S. BELL, master mechanic on special duty in the office of the chief of motive power of the Pennsylvania, has been appointed superintendent of motive power of the Eastern Ohio division at Pittsburgh, Pa.

A. C. KELLY has been appointed air-conditioning engineer of the Missouri Pacific at St. Louis, Mo.

JOHN W. HORINE, JR., supervisor of Diesel-electric locomotives of the Pennsylvania at Harrisburg, Pa., has been appointed assistant superintendent of motive power, with headquarters at Harrisburg. Mr. Horine was born at Charleston, S. C., and is a graduate of Lehigh University. He has been employed by the Pennsylvania in various motive-power department assignments since 1922. He served successively as general electrician at Philadelphia, Pa., and supervisor of Diesel-electric locomotives at Harrisburg until his appointment as assistant superintendent of motive power.

Car Department

L. P. FREVE, assistant foreman of the Canadian National at Chauvigny, Que., has been appointed car foreman at Cochrane, Ont.

L. T. BROWN, gang leader of the Norfolk & Western at Shaffers Crossing, Va., has been transferred to the position of car foreman at Pulaski, Va.

A. O'MALLEY, car foreman of the Canadian National at Cochrane, Ont., has retired.

FRED F. SMITH has been appointed assistant passenger-car foreman of the Southern, with headquarters at Chattanooga, Tenn.

W. I. STULTZ, car foreman of the Norfolk & Western at Pulaski, Va., has been transferred to the position of car foreman at Bristol, Va.

W. P. BAILEY, car foreman of the Norfolk & Western at Bristol, Va., has been transferred to the position of assistant car foreman at Williamson, W. Va.

S. PARSONS, car foreman of the Canadian National at the Toronto, Ont., coach yard, has been appointed car foreman at Ottawa, Ont.

Diesel

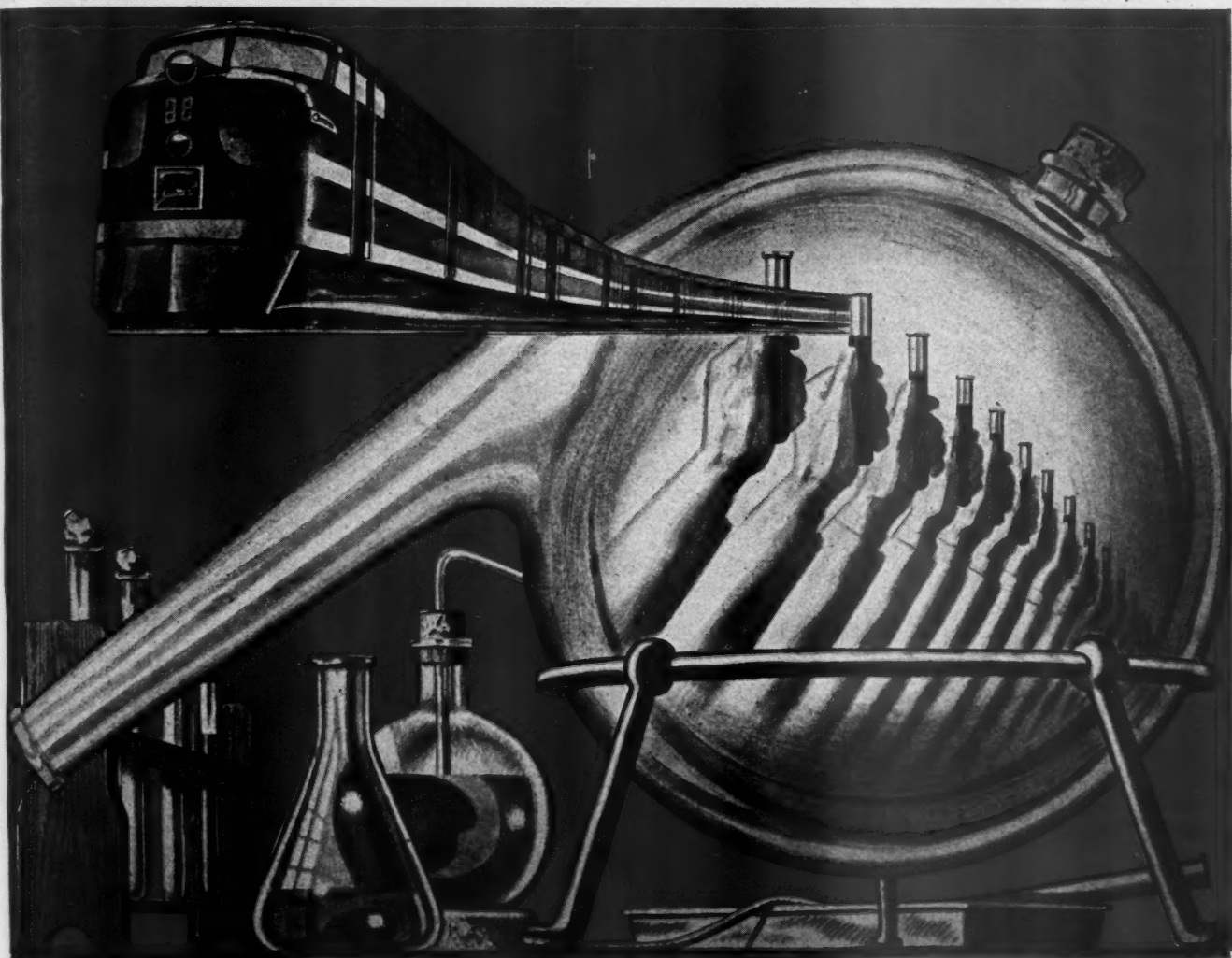
JOHN E. PRUITT has been appointed general Diesel supervisor, Central Lines, of the Southern, with headquarters at Atlanta, Ga.

J. E. WIGHTMAN, JR., master mechanic of the Maryland and Delmarva di-

The Sign of QUALITY

Esso

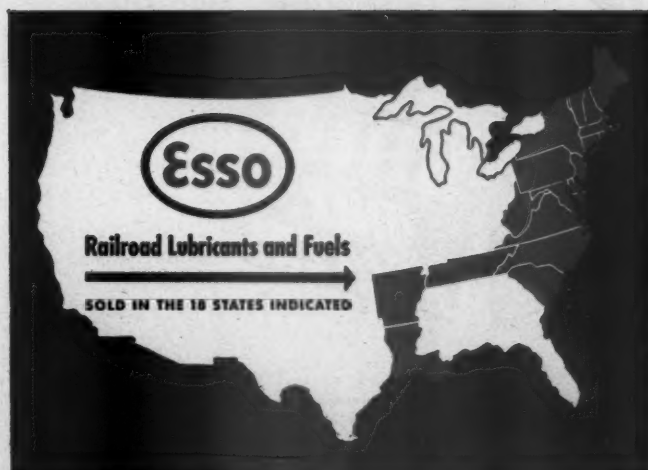
The Symbol of SERVICE



What do test tubes have to do with trains?

Every locomotive rolling with Esso Fuels and Lubricants is a "laboratory on wheels." Every time Esso Railroad Products are applied to a particular railroad problem, the results are accurately recorded. In this way, Esso Products can be improved in practical use—made better not only in Esso Marketers' great laboratories, but also in the thousands of operating "labs" that pile up millions of miles out on the nation's right-of-ways.

August, 1948



ESSO STANDARD OIL COMPANY

Boston, Mass.—New York, N. Y.—Elizabeth, N. J.—Baltimore, Md.
Richmond, Va.—Charleston, W. Va.—Charlotte, N. C.
Columbia, S. C.—Memphis, Tenn.—Little Rock, Ark.—New Orleans, La.
ESSO STANDARD OIL COMPANY OF PENNSYLVANIA
Philadelphia, Pa.



Do you spend your heating dollars only to heat your ceiling? Or, do you want the very most from your heating dollar? If so, don't be confused by unit heaters offering great BTU delivery and high outlet temperatures. Any unit heater that fails to deliver warm air to the floor level where it is needed most is simply spending your heating dollars to heat that part of your building that does not require heating.

BTU rating in a unit heater does not mean everything. It is the CFM and outlet temperature that really does the job.

Investigate GRID Unit Heaters that are designed for low outlet temperature and greater air delivery. They are constructed to deliver warm air in greater volume to the working zone where it is needed . . . resulting in saving in fuel consumption, assuring the very ultimate from your heating dollar.



HIGH TEST
**CAST
IRON
HEATING
SECTIONS**

GRID heating sections are one-piece construction high test cast iron—the metal for permanency . . . no electrolysis because there are no dissimilar metals used in GRID construction. Hence, no maintenance expense—but years of trouble-free heating service.

Write today for complete details, capacity tables — the story of GRID to

D. J. MURRAY MANUFACTURING CO.
WAUSAU, WISCONSIN

visions of the Pennsylvania at Wilmington, Del., has been appointed as supervisor of Diesel-electric locomotives at Harrisburg, Pa.

L. W. VAN NATTAN, supervisor of Diesel equipment of the Kansas City Southern at Pittsburg, Kan., has been appointed superintendent of Diesel equipment at Pittsburg.

Electrical

W. SMYTH, electrician of the Canadian National, has been appointed district electrician, with jurisdiction over the Quebec district and with headquarters at Quebec, Que.

W. F. AVES, electrician of the Quebec district of the Canadian National at Quebec, Que., has retired.

Master Mechanics and Road Foremen

H. D. AHN, master mechanic of the Philadelphia Terminal and Atlantic divisions of the Pennsylvania at Philadelphia, Pa., has been transferred to the position of master mechanic at Wilmington, Del.

E. C. HANLEY, assistant master mechanic of the Columbus, Cincinnati and Toledo divisions of the Pennsylvania has been appointed master mechanic of the Chicago Terminal and Logansport divisions, with headquarters at Chicago.

P. G. JAMISON, engine-house foreman of the Pennsylvania at York, Pa., has been appointed assistant master mechanic of the Columbus, Cincinnati and Toledo divisions.

W. C. FLECK, master mechanic of the Chicago Terminal and Logansport divisions of the Pennsylvania at Chicago, has been transferred to the Philadelphia Terminal and Atlantic divisions, with headquarters at Philadelphia, Pa.

CLARENCE A. FRICK, general foreman of the Eastern lines of the Southern at Alexandria, Va., has been appointed master mechanic at Columbia, S. C.

F. F. FOSTER, assistant road foreman of engines of the Baltimore & Ohio at Cumberland, Md., has been transferred to the position of assistant road foreman of engines at Willard, Ohio.

D. E. HOLCOMB has been appointed master mechanic-general foreman of the Union Terminal and the St. Joseph Belt, with headquarters at St. Joseph, Mo.

Shop and Enginehouse

J. R. POWELL, general enginehouse foreman of the Chesapeake & Ohio at Huntington, W. Va., has been appointed general foreman at Peach Creek, W. Va.

CHARLES R. JESIEK has been appointed assistant night enginehouse foreman of the Chesapeake & Ohio at Wyoming, Mich.

W. J. KNAPP has been appointed general foreman of the Chesapeake & Ohio at St. Albans, W. Va.

PHILLIP F. GEARY, JR., has been appointed night enginehouse foreman of the Chesapeake & Ohio at Plymouth, Mich.

NICHOLAS E. MAGETTE has been appointed assistant enginehouse foreman of the Southern at Chattanooga, Tenn.

P. L. SAVAGE has been appointed assistant shop superintendent of the Huntington shops of the Chesapeake & Ohio at Huntington, W. Va.

CECIL D. SCHWINE, JR., assistant day enginehouse foreman of the Southern at Chattanooga, Tenn., has been appointed general foreman at Meridian, Miss.

J. S. KATZENBERG has been appointed general enginehouse foreman of the Chesapeake & Ohio at Huntington, W. Va.

M. L. GOULD has been appointed general foreman of the Chesapeake & Ohio at Crane Fork, W. Va.

Obituary

HENRY F. NEILL, superintendent of power of the Sacramento Northern, with headquarters at Sacramento, Calif., was killed recently in an automobile accident.

C. N. KITTLE, assistant superintendent of equipment of the New York Central, Line East, with headquarters at New York, died on June 15. Mr. Kittle was born in 1891 at Louisville, Ky. He entered the employ of the New York Central Lines at Beech Grove, Ind., as a steel car mechanic in 1915. He enlisted in the U.S. Army in February, 1918, and served overseas in the Signal Corps. He was mustered out in June, 1919, and



C. N. Kittle

returned to the job of steel car mechanic at Beech Grove. In December, 1919, he became an inspector on new equipment being built at various plants; in 1923, car foreman at the Brightwood shops, Indianapolis, Ind.; in 1927, general car foreman at Linndale, Ohio; in 1933, general foreman as Ashtabula, Ohio, and in 1942, division general car foreman, Line East, with headquarters at Buffalo, N.Y. In 1945 Mr. Kittle was appointed superintendent of car shops at East Buffalo, N.Y., and on November 1, 1947, assistant superintendent of equipment.